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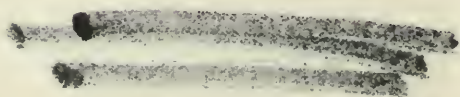
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CONTENTS

THE OLD NAVY. By Captain J. K. Taussig, U. S. Navy.....	1
PROMOTION IN THE NAVY. By Lieut. Commander F. A. L. Vossler, U. S. Navy.....	7
WHAT IS THE MATTER WITH OUR NAVY'S RADIO? By Lieutenant Bowden Washington, U. S. N. R. F. (Inactive).....	21
MANUFACTURE OF FOURTEEN- AND SIXTEEN-INCH CUPRO-NICKEL RO- TATING PROJECTILE BANDS BY CENTRIFUGAL CASTING MACHINE PROCESS. By Louis J. Josten.....	29
THE COMMANDING OFFICER, RECRUITING OFFICER, AND MEDICAL OFFICER VERSUS DESERTION. By Captain J. S. Taylor (M. C.), U. S. Navy.	39
INDIRECT FIRE FOR NAVAL GUNS. By Commander Walter S. Anderson, U. S. Navy	61
NAVIGATION NOTES. By Commander J. F. Green, U. S. Navy.....	67
PSYCHOLOGY AND THE NAVY. By Lieutenant F. H. Gilmer, U. S. Navy.	77
CONSTITUTION AND BY-LAWS	81
SECRETARY'S NOTES	89
PROFESSIONAL NOTES	91
NOTES ON INTERNATIONAL AFFAIRS	138
REVIEW OF BOOKS	149
INFORMATION INDEX	90

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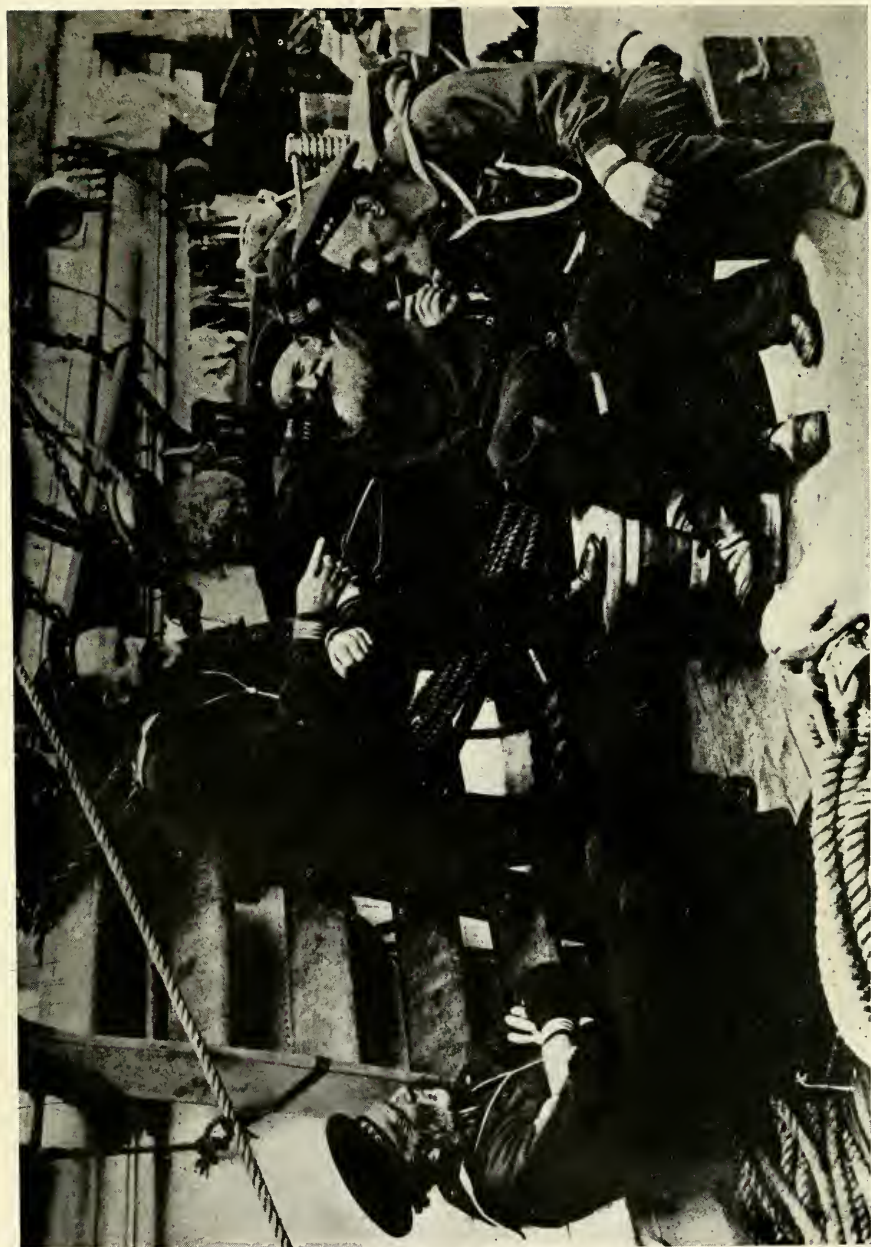
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THE OLD NAVY.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE OLD NAVY

By CAPTAIN J. K. TAUSSIG, U. S. Navy

The famous picture known as "The Old Navy," reproduced herewith, was taken on board the U. S. S. *Mohican* in 1888. The photographer was Assistant Surgeon H. W. Whitaker, U. S. Navy.

When Captain J. R. Y. Blakely and the writer were on duty in the Bureau of Navigation in 1913, the former had the happy thought that it would be of interest to ascertain the identity of the characters in the picture. Under his initiative, the two of us proceeded to gather what information was to be obtained from the Bureau's records, and from other sources.

A visitor to the Bureau, Rear Admiral George C. Reiter, informed us that the picture was taken on board the *Mohican*, he thought in 1886. This gave a clew for starting the research. On looking up the Navy Register for 1886 it was found that several officers conveniently near to Washington were on board the *Mohican* at that time. Among these officers are the present Rear Admirals R. F. Nicholson and E. W. Eberle, and Captain R. L. Russell. Captain Blakely sent a copy of the photograph to these three officers, and also to Chief Boatswain's Mate George A. Dueland and Chief Quartermaster Lars P. Jonsson, both retired, who were on the *Mohican* during this cruise.

The replies received from these officers and men were not only interesting, but gave sufficient information so that, with a study of the muster rolls and descriptive lists, a positive identification of the four men could be made. There had been no question as to three of them, but there was a difference of opinion in regard to the old white bearded sailor with his hands behind his head. Some thought he was John Ward, armorer; some thought he was old Norman; others said he was "Old Griff." These latter were correct, as he was finally unquestionably identified from the muster rolls and descriptive lists as John T. Griffith, Chief Carpenter's Mate. The reason for the difficulty in the identity of this man was due to the supposition that the picture was taken in 1886, while it turned out that it was actually taken in 1888. Griffith was not transferred to the *Mohican* until the latter date, and was on board for only a month. Some of the officers who were on board in 1886 when the other three men were also there, were transferred to other vessels before Griffith arrived on the *Mohican*.

The four men, with a brief transcript of their services, are:

1. GILBERT H. PURDY, who is standing addressing the others. Purdy was born in 1828, and therefore was 60 years old when the picture was taken. He was a physically powerful man and was remarkably well preserved, as is shown by the photograph. He died December 24, 1912, at San Diego, California, at the age of 84, being at the time of his death the oldest man on the retired list of the navy. During the Civil War he served as sergeant in Battery K, 4th U. S. Artillery, and as a seaman on board several naval vessels. He also had the honor of serving under Admiral Dewey on the *Olympia* during the Spanish-American War. He was transferred to the retired list on February 7, 1900. Purdy served as captain of the hold on board the *Mohican* from May 25, 1885, to August 28, 1888.

2. DAVID IRELAND, seated with arms folded. Ireland was born in 1833, and was therefore 55 years old when the picture was taken. He first enlisted in the navy on April 8, 1850, so he had seen 38 years of service when on the *Mohican*. He served on many ships in all parts of the world and died at the Mare Island Hospital on January 16, 1894, aged 61 years. He served on board the *Mohican* from May 25, 1885, to November 20, 1890, as captain of the forecabin, seaman, and captain of the hold.

3. JOHN KING, seated on ditty box. King was born in England in 1834, so at the time the picture was taken was 54 years old. He followed the sea in merchant ships for a number of years before enlisting in the navy, which he first did on April 9, 1875, he then being in his 42d year. He was finally discharged on April 2, 1896, and admitted to the Naval Home at Philadelphia. He served on board the *Mohican* from May 25, 1885, to January 25, 1899, as chief gunner's mate. The exact date of his death is not known.

4. JOHN T. GRIFFITH, seated with hands behind his head. Griffith was born at Albany, New York, December 25, 1826, being 62 years of age when the picture was taken, and the oldest man of the group. The record of his first enlistment is not at hand, but he last enlisted on October 18, 1888, and was finally discharged on December 10, 1889. He served on board the *Mohican* as chief carpenter's mate from June 3 to June 30, 1888. The date of his death is not known.

The fine type of old salt depicted here is now extinct so far as our navy is concerned. It seems, therefore, that it is fitting for the historical interest to make a record in print of some of the things that are known concerning these men. It is felt also that those of the old navy who were closely associated with the wonderful sailor men of those days, as well as those of the modern navy who never had the pleasure of such associations, will appreciate quotations from the letters to Captain Blakely written by the officers who were shipmates of the men in the picture.

Admiral Nicholson wrote:

I remember very distinctly the photo referred to in your letter. It was taken in the *Mohican* one day while we were at sea running down the trades. I was on deck and noticed the four old salts over in the port gangway, where the quartette usually congregated, and it struck me that it was a subject for a fine picture. I called Drs. Harvey and Whitaker, who were doing most of the photographic work on board ship, and suggested that they bring up a camera and catch them, which they immediately proceeded to do with the well known results.

The man standing up is Purdy, captain of the hold, who was a great big six-foot-two man from New York State. Purdy was a great disciple of Ingersoll and Tom Paine and in all probability at the time pictured was giving them something from "The Age of Reason" or "The Rights of Man."

The old chin-whiskered fellow was King, quarter gunner, a fine old sailor, but one of the old style that went ashore once a quarter and had to be

brought back by the master-at-arms each and every time, but a splendid old fellow nevertheless.

The smooth-faced fellow was Dave Ireland, who told me he was from Delaware, and I knew he corresponded with some nieces in Delaware. He had passed his earliest years in the merchant service, part of it in English ships, and often regretted that he had not joined the navy earlier. . . . He was of a saving disposition, and I heard at the time of his death that he had 10,000 dollars in cash. I remember in Auckland once he overstayed his leave, which was quite unusual for him, and was brought on board by the police which cost him three pounds, and ever afterwards the boys of the ship would get him wild by attracting his attention and holding up three fingers. On one occasion they so riled him that he threw the quartermaster's glass at them.

The other man was "Griffin," the armorer. A very quiet, self-respecting old fellow, and the last I heard of him he was somewhere around Mare Island.

Purdy, I saw a few years ago at San Diego. He had charge of a naval militia ship down there. Old King passed his earliest years in the East India Company's Navy. The last I heard of him he was at the Naval Home in Philadelphia.

Admiral Eberle wrote :

I remember very distinctly Chief Gunner's Mate John King who is seated on the ditty box, Captain of the Hold Gilbert H. Purdy who is standing against the ladder spinning yarns, and Quartermaster Dave Ireland, who is seated against the ladder with his arms folded.

I do not remember the fourth man seated on the division tub with his hands behind his head, but I am reliably informed that he was a Chief Carpenter's Mate by the name of Griffin, or Griffith, probably the former. He was identified by Chief Boatswain McKenna, and Robert J. Niddrie, who is in the Electrical Department at the navy yard—both of whom were apprentice boys with me on the *Mohican*. They state that they remember when the picture was taken by Dr. Whitaker, and that Chief Carpenter's Mate Griffith had been previously on the *Adams* and had been transferred to the *Mohican* for passage home.¹ The Chief Carpenter's Mate of the *Mohican* was a man by the name of Brady. From their statement, and to the best of my recollection, Ward, armorer, was a smaller man than the one in the picture and wore a beard more pointed and somewhat on the style of Purdy's. They state that King and Ward had been in the British Naval Service when young men.

Purdy was a man of great physical strength and was quite a spinner of yarns. Dave Ireland, the quartermaster, made a cruise afterwards on the China Station in the *Marion* with the rate of captain of the hold. . . .

¹ The records show that Admiral Eberle was detached from the *Mohican* before Griffith reported on board. This accounts for his doubts as to the identity.

It is stated that Old Ireland in his latter days was very thrifty and saving, and had become a tee-totaler. I also understand that he had either nieces or nephews living in Delaware. It is told of the old man that when the doctors at the hospital at Mare Island found that he had not many months to live, suggested to him that he would be more comfortable in his old days by boarding with some family in Vallejo, where he would receive the comforts of home, but he stated that he could not afford it. However, when he died, it is stated that he had about 9000 dollars saved up.

Old John King was quite a character of the old days. I recall very distinctly that he would draw what money was due him and go ashore once in three months and promptly spend it for rum, and after he was brought back on board and sobered up he always said he was happy now because he could not go ashore for another three months. Boatswain McKenna reminded me of two escapades of John King which were very amusing and very characteristic of him. Once in Corinto, Nicaragua, when King had gone ashore and was overtime, a reward was offered for him, but somehow he heard about it and when chased by the Corinto police he made for the beach and swam off to the ship, being chased by the police in a shore boat; but he made the gangway before they could catch him. When the ship was at Callao, Peru, the Chief Petty Officers' Mess decided that they would elect a new caterer, and for some reason they elected John King. King took the mess money to go ashore to buy stores, as was the custom in those days. He sent back to the ship one Edam cheese and a bag of salt for his mess, and proceeded to have a good time until brought off by the police a week or 10 days later. But he was a good and faithful old soul, and was busy from reveille to taps.

King, Purdy and Old Dave Ireland were in the habit of "hanging out" in the port gangway where you see them in the picture. No finer or more reliable seamen could be found anywhere.

From Captain Russell's letter:

King and Ireland I remember perfectly, having had Ireland for quartermaster of the watch many times when I was standing watch on the *Mohican*, and I remember to this day many of the conversations I had with Ireland, who was a very interesting old fellow, and told me a lot of his experiences. You will find by looking up the record of the Brazilian Squadron, in the early fifties, that Ireland was down there on board one of the ships. . . .

Ireland came home on the *Pensacola*, arriving in Norfolk in 1884 after a trip around the world, and on the advice of a friend, he put about all his savings into a Norfolk bank just in time to have the bank fail and lose about everything.

The extracts quoted from the letters of Admirals Nicholson and Eberle, and of Captain Russell—which letters were written 25 years after the photograph was taken—show us how well the officers of the old navy came to know the men with whom they were shipmates. We also get from them a good insight into the

character of the old time salt. That these men were of a type unknown to the younger generation of the new navy is evident to anyone who has the opportunity of visiting a modern man-of-war; but the impression they made on their officers shows us that there was something so unique and so impressive about these faithful old sailors, that their sayings and doings leave a lasting impress on the memories of those who had the pleasure of being shipmates with them.

This picture, "The Old Navy," depicts for us a rare combination of characters. We have here in Purdy the spinner of yarns and exploiter of theories—different from the usually accepted ones—but always of sufficient interest to guarantee an audience. In Ireland we have the serious-minded listener. A man of sturdy character who loved his ship and who loved to stay on board—preferring to save his money to spending it on a good time. King typifies the sailor of the stories: One who loved rum and who spent his money freely whenever he had the chance. He was the type who was absolutely reliable when on board ship, but did not see that the beach was for any other use than a place where one could get drunk. Griffith shows us the old man who has matured in the service—the kind that acquired none of the bad traits, but all of the good traits of the old time sailor.

While all of these men undoubtedly had their individual ideas of right and wrong, and while there is no doubt but that these ideas differed widely, all the evidence in regard to them—which evidence is true in general for many of the other old salts of their day—shows in all of them a great outstanding quality. This was their faithfulness and their energy combined. The following, which Admiral Eberle wrote about King is true for all of them: "He was a good and faithful old soul, and was busy from reveille to taps."

It is hoped that others who have information concerning such sailormen as are shown in this picture, will make a record in writing of it, so that the famous type will not be lost to the coming generations.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PROMOTION IN THE NAVY

By LIEUT. COMMANDER F. A. L. VOSSLER, U. S. Navy

Two systems of promotion in the navy have gone by the board and we are now struggling with the third. If we accept the maxim that "Proof of the pudding is in the eating," we must agree that this third and present system of promotion by election, rejection, and selection is not very satisfactory. In looking for the causes of restlessness prevailing in the service now-a-days, the present method of promotion may, among other things, be properly looked upon askance. Nothing is more disconcerting to the ambitious individual than suddenly to see his future advancement and success, as well as the welfare of his family, dangling by a thread.

In dealing with this vital question in connection with the officer personnel, too much veering from one extreme to the other has been done. First, there was promotion by seniority—a pernicious system, preventing even the most brilliant officer from being advanced before his regular turn came, no matter how incapable those ahead of him were. Then with a view to getting rid of the incompetents, a law was enacted providing for the compulsory retirement of a certain number of officers each year. This served to relieve the service of many officers who had undoubtedly missed their calling, but it provided no way for the more efficient officers to get to the top more quickly than those having less ability. So, still another law was passed providing for promotion to the higher grades by selection only, thus going to the other extreme.

It is practically impossible to evolve a system of promotion which will be entirely satisfactory, at all times, to all those who are affected by its provisions. However, the writer believes that the present system of promotion is not as satisfactory as it should be, as evidenced by the numerous resignations submitted since

"selection up" became effective. Consequently, it is with the idea of finding a better system of promotion in the navy that the subject is discussed in this paper.

Before an improvement over the present method can be suggested, it is necessary to consider what is wanted.

The principal object in view is to improve the efficiency of the navy, and the navy, after all, is just as efficient as the officers make it—no more and no less. It follows then, that the whole naval establishment would be benefited by any change in the present scheme of promotion which would improve the morale of the officers or inspire them to exert greater effort for the improvement of the service.

The value of an officer to his service (aside from his professional ability) is similar to that of other men, and is in proportion to the following conditions:

(1) His interest and pride in the service.

(2) A degree of assurance that he will be promoted from grade to grade in a reasonable length of time, provided he works and performs his duties conscientiously and effectively.

(3) The manner in which he is able to live and support his family as a result of his effort.

(4) The hope of assignment to duties in the service commensurate with his rank and abilities.

(5) The confidence which he has in the fairness and justice of the system of advancement under which he works.

(6) A degree of assurance that his life's effort will produce sufficient income after retirement from active duty to support him and his family in old age.

Let us now analyze the methods of promotion which we know, with a view to combining the elements in them that will most nearly meet the above requirements.

I. PROMOTION BY SENIORITY

Disadvantages:

(1) Discourages initiative.

(2) Fosters perfunctory and indifferent performance of duty.

(3) Offers no more reward for efficiency than it does for inefficiency.

(4) Prevents the most capable officers from reaching the top first.

(5) Makes it possible for incompetent officers to reach the most important positions, both in peace time and in war.

(6) Does not eliminate the incapable and undesirable officers.

(7) Does not provide for a flow of promotion.

Advantages:

(1) Inspires confidence in regard to future promotion and assignment to duty, thus largely doing away with discontent.

II. SELECTION OUT

Disadvantages:

(1) Provides no means for the most meritorious officers to reach the top ahead of the incompetent and dilatory ones.

(2) Requires (after a few years of operation) many very capable officers to be selected out, and their services thus lost to the navy.

(3) Causes, as a result of (2), the future promotion of *all* officers to become uncertain, producing discontent and lowered morale.

(4) Does not enable a Board of Selection to determine the relative standing of an officer in his grade, due to insufficient data shown in fitness reports.

Advantages:

(1) Eliminates the incapable, dilatory, and least useful officers, as well as their undesirable influence on those with whom they serve.

(2) Warns the individual to exert an effort sufficiently great in the performance of duty to keep ahead of the class from which "selections out" are made.

(3) Affords a certain amount of confidence in future promotion to those whose records are clear and whose efficiency is unquestioned.

(4) Provides for a flow of promotion.

III. SELECTION UP

Disadvantages:

(1) The difficulty for a selection board to determine from the fitness reports the relative merit of officers eligible for promotion.

Rear Admiral Wm. S. Sims, U. S. N., in a letter headed "Pro-

motion by Selection. Fundamental Defects of Present System," published in the service papers in the summer of 1919, states:

These reports (referring to reports of fitness) do not enable the board to determine the relative merits of officers, and for the following reasons:

(a) They are individual reports made by relatively a very few of the hundreds of officers in the grades above the candidates, and consequently they do not express the service reputation of these officers.

(b) Moreover, as these reports extend from the beginning of an officer's career up to date, there is only a small proportion of them which concern an officer's *present* abilities, and from this very small number of reports, it is all the more impossible to arrive at the candidate's service reputation—upon which alone his relative merit can be established.

(c) Not only is it impossible, from a consideration of a certain officer's fitness reports, to determine his service reputation, but it is equally impossible to determine his fitness as compared with that of the other officers of his grade.

(d) This impossibility of determining the relative fitness of officers is due to the well-known fact that reports of fitness are of practically uniform merit, being generally much too favorable.

(2) Causes lack of confidence on the part of every officer, in future advancement. This naturally results in a dissatisfied personnel.

(3) Places a premium on inaction in cases where progressiveness and initiative may result in occasional failure, rather than success. In other words, the system tends to stunt initiative since the probabilities of reward in the form of selection for promotion are possibly greater when an officer's record is free of blemishes, than if his record is excellent but marred by one or two adverse reports. One mistake on the part of an officer (when a report of this mistake is placed on his record) may result in his being "passed over" by the Selection Board, thus humiliating and severely punishing him. On the other hand, an officer is not necessarily advanced more quickly on account of his having demonstrated unusual ability in a few instances, thus making a good record better. In this system of promotion, to do what is required means (in most cases) advancement; while to attempt more than that, if not successful, *may* result in humiliation and punishment. The professional activities of a naval officer should in no way be influenced by the principle of personal "safety first."

(4) "Selection up" does not provide for eliminating the undesirable and incompetent officers from the service. The present law provides for their automatic retirement at certain ages if not promoted, but this provision operates so slowly that the bad effect

on the service of their remaining on active duty is not eliminated. Thus, under this system, officers who are passed over by the Selection Board may remain in the service for many years, forming an element in the navy of discontent and contamination.

(5) When an officer is "passed over" by the Selection Board, he has no redress, no matter what the circumstances are. He is not notified why he was found unqualified for promotion. In fact, he is not even told that he has been rejected. He is totally ignored in this respect. To the conscientious officer this is most humiliating and discouraging. Yet, the system pre-supposes that this same officer will go cheerfully on, exerting greater effort than ever to perform his duties, not knowing, in many cases, why he has been placed in the "discard." If it were humanly possible for him to do this, how is an officer to know that he is not exerting a special effort along the same lines of his profession which was mainly the cause of his rejection? For example, the Selection Board might find an officer unqualified for promotion on account of his having been assigned to engineering duties for an unusually long period of time. Under the present system, such an officer might continue to do engineering duty for years—and quite satisfactorily, too—without knowing that he had been rejected for that very reason.

(6) The personnel of practically every Selection Board is different from the preceding one. This cannot help but result in certain changes in policy with regard to making selections, as evidenced by the fact that frequently in the past an officer rejected by one selection board has been selected by a subsequent board, while in the meantime the officer under consideration has not even had a change of station or duty, nor time to further demonstrate his ability or inability. Since the action taken by *both* boards in these cases—of which there have been many instances—cannot be correct, it follows that in all such cases some injustice has been done, either to the individual or to the service.

(7) This system fosters more or less jealousy among the officers, which, in turn, reduces cooperation and coordination throughout the service.

(8) Fails to provide for a flow of promotion.

(9) It does not necessarily result in placing the most capable officers at the top of each grade.

Advantages:

- (1) Reduces the probability of wholly incompetent officers being promoted to high rank.
- (2) Places the less efficient officers in each grade below the more efficient ones.

Thus we see that each of the three methods considered have some good and some bad points. Now, if a system of promotion could be adopted which would embody the advantages, and at the same time do away with the disadvantages enumerated above, we would certainly have a system far superior to any yet tried. The writer believes that this can be accomplished in the following manner:

Retain in effect the present laws providing for retirement due to age in grade, and for a Board of Selection.

Repeal the law now in force governing selections, and substitute a law for it, to read in substance as follows:

(a) The Board of Selection *may*, at its discretion, once during each calendar year, select out for compulsory retirement from the grade of permanent commander in the navy, a number of officers not to exceed $\frac{5}{10}$ of 1 per cent of the total number of officers in that permanent grade, as shown by the navy register on the first day of January of the year in which the Selection Board meets. The officer, or officers so selected out shall be the one, or those, in the permanent grade of commander whom the board considers of least service to the government in that grade.

(b) The Selection Board *may*, at its discretion, once during each calendar year, select out for compulsory retirement, from the grades of permanent lieutenant and permanent lieutenant commander in the line of the navy, a number of officers from each of these grades, not to exceed 1 per cent of the total number of officers in each of these permanent grades as shown by the Navy Register on the first day of January of the year in which the Selection Board meets. The officers so selected out shall be those in the grades of permanent lieutenant and permanent lieutenant commander whom the board considers of least service to the government in those grades.

(c) Whenever any officer is selected out for compulsory retirement, in accordance with the provisions of paragraphs (a),

or (b), he shall have the right to demand a naval court of inquiry, in order that he may have an opportunity to show why he should not be retired in this manner.

(d) And, provided further that any officer designated for compulsory retirement as provided for in paragraphs (a), or (b), shall, upon being placed on the retired list of the navy, receive, annually, while on inactive duty, $2\frac{1}{2}$ per cent of the pay of the permanent grade in which he retired, for each year, or fraction thereof, of service which he has performed on the active list in the navy or marine corps.

(e) After having complied with paragraphs (a) and (b), the Selection Board *may*, at its discretion, select for promotion from those officers who are eligible for promotion to the next higher grade, from the grades of permanent captain, commander, and lieutenant commander, in the line of the navy, a number of officers in each of these grades, not to exceed 3 per cent, or fraction thereof, of the number of officers in each of these permanent grades to be promoted during the calendar year in which the Selection Board meets. The officer, or officers, so selected for promotion in each grade, shall be placed at the head of the list of officers who are being promoted to the same grade at the same time, and shall take precedence there according to his standing on the navy list in the permanent grade from which he is being promoted; provided, however, that no officer so promoted shall be placed, on the list of the grade to which he is promoted, above any other officer in that grade who has previously advanced to that grade in this manner.

(f) If the Selection Board designates any officer for promotion as provided in paragraph (e), it shall be the duty of the board to select that officer, who, in the opinion of the board, is professionally superior to any other officer in the grade from which he is being promoted, except as provided in paragraph (e), when more than one officer is specially selected for promotion to a single grade.

(g) All officers in all grades in the line of the navy who are not selected out for compulsory retirement, or who are not specially selected for promotion, as herein provided, shall be promoted according to seniority, after having qualified by examinations, in accordance with existing laws.

(h) And provided further, that hereafter, in order that officers of the navy or marine corps may enjoy, to a certain degree, the same freedom of action, in regard to retirement, as is now accorded the enlisted force of these services, said officers may, at their own request, be transferred to the retired list after 20, or more, years of active service in the navy or marine corps, as the case may be; and when so transferred an officer shall receive, annually, for each year of active service in the navy or marine corps, $2\frac{1}{2}$ per cent of the annual pay of the permanent grade in which he was at the time of his retirement.

GENERAL DISCUSSION

In order to illustrate the system of promotion which has just been outlined, let us take an example and work it out, assuming that there are 4600 officers of the line in the navy on January 1 and that a class of 400 midshipmen graduate from the Naval Academy in June and receive their commissions as ensigns. Let us assume, also, that the officers of the line are to be distributed in the different grades according to the present law; that is, 1 per cent in the grade of rear admiral, 4 per cent in the grade of captain, 7 per cent in the grade of commander, 14 per cent in the grade of lieutenant commander, $32\frac{1}{2}$ per cent in the grade of lieutenant, and $41\frac{1}{2}$ per cent in the grades of junior lieutenant and ensign.

A detailed explanation follows the table.

Grade	No. in each grade. Basis, 4600 total in navy (1)	No. in each grade "which may be "selected out", (2)	No. in each grade, after selections out and adding 400. Basis 4977 in navy (3)	No. in each grade increased by (4)	Total promotions in each grade (5)	No. selected 'up' (6)
Rear admirals.	46	None	50	4	4	..
Captains	184	None	199	15	19	1
Commanders ..	322	2	348	26	45	2
Lieut. comdrs .	644	6	697	53	98	3
Lieutenants ...	1495	15	1618	123	221	..
Lieuts. (j.g.) and ensigns,	1909	None	2065	156	400	..

Total selected out, 23.
From 4600, subtract 23 4577
Add new ensigns..... 400
Basis of new apportionment... 4977

Total selected up, 6.
For selections "up", take three
per cent, or fraction thereof of
number in column (5).

In the table, *column (1)* shows the number of officers allowed in each grade, figured on the basis of 4600 line officers in the navy; *column (2)* shows the maximum number of officers in the grades of commander, lieutenant commander, and lieutenant which may be selected out for compulsory retirement in accordance with the provisions of paragraphs (a) and (b). (Note that the Selection Board is not required to select out *any* officers. The table shows the maximum number the board is allowed to select out.) *Column (3)* shows the number of officers allowed in each grade after deducting those "selected out," from 4600, and then adding 400, due to the graduation of midshipmen; *column (4)* shows the increase in each grade due to the net increase in the total number of officers in the navy, as a result of the graduation of midshipmen; *column (5)* shows the total number of promotions to each grade. This is the sum of the increase shown in *column (4)* and the vacancies created in each grade due to the promotions from that grade; and *column (6)* shows the number of officers in the grades of captain, commander and lieutenant commander which *may* be specially selected up to head the list of those being promoted to these respective grades. (Note that the Selection Board is not required to "select up" *any* officer, from those eligible to be promoted. The table shows the maximum number the board is allowed to "select up.")

The writer claims that, if put into operation, this system of promotion would accomplish the following desirable results, all on the side of the advantages as set forth elsewhere in this article; and that practically all of the disadvantages mentioned would be eliminated:

(1) It would rid the service of the incapable and unsatisfactory officers without doing them an injustice, since those "plucked" would go out when comparatively young, and would thus find it less difficult to adapt themselves to the work and to the conditions outside the navy.

(2) It would provide for placing the specially capable, brilliant, and efficient officers—those whose theoretical and practical abilities are unquestionably far above the average—at the top, where the navy would derive the most benefit from their services as leaders.

(3) It would have a stabilizing effect on the entire officer personnel, in that it would enable the average officer in every grade (and by *average*, I mean the 95 to 99 per cent of the officers in the

navy who go about their daily duties in a diligent, conscientious, and officer-like manner) to look with confidence to the future—something which he cannot do under the present system of promotion by selection, and which, in the opinion of the writer, is contributing a great deal to the prevailing unrest and dissatisfaction in the service.

(4) It would do away almost entirely with the principal defect in the present system of promotion by selection; namely, the practically impossible problem of determining the *relative* efficiency of officers by their fitness reports. It is not difficult to determine from an officer's record whether he should be selected *out* or not. It is a simple matter to find the defective apples in a basketful picked from the same tree. Likewise, it is not a difficult proposition to determine from their records and their service reputation, which one, or two, or three officers in a certain grade stand out conspicuously above the rest in ability, initiative, leadership, and general efficiency. But it is practically impossible to justly grade all the officers according to these qualities with the present available information. It is true, there may not be any officers in the list of eligibles who come up to this high standard. In this case, according to the proposed system, no one in that grade would be selected up. But if there should be any, then it would be the duty of the board to designate them for selection up, thus giving the navy the benefit of their special ability.

(5) This system of promotion would constantly stimulate effort and initiative on the part of every officer who has any pride and interest in the service, since those who are dilatory and those who fail to exhibit the characteristics of an officer and a gentleman, would soon find themselves "plucked" from the service. On the other hand, it would offer reward in the form of special promotion and position to those who show by their records and their service reputation that they deserve to be placed above others of less ability.

(6) Since only those who are considered by the Selection Board to be below the standard of efficiency and character would be selected out, the flow of promotion would be increased, under the proposed system, without doing injury to the service.

(7) It would practically prevent incompetent officers from reaching high rank. For example, after the operation of this system, for, say, 10 years or more, there would be very few officers

in the grade of rear admiral who had not previously been specially selected up to the grade of captain because of unusual ability.

(8) In the system proposed, there must be an *obvious reason* for selecting an officer for compulsory retirement. Likewise, there must be *obvious reasons* for "selection up." Furthermore, an officer's service reputation, necessarily, would have to be carefully considered in either case, before the Selection Board could properly make any recommendation. The writer believes that this would be a very important and a very desirable improvement over the present method of promotion, where it is not possible to consider the service reputation in the case of most officers in connection with their selection. The reason for this is, that there are such a *very* few officers whose service reputations are out of the ordinary—either good or bad. The "crackerjack," as well as the "hopeless failure," is always especially well known, and no fitness report, nor election, is required to determine who he is. It would be a very difficult matter for an officer to prevent his elimination, or to force his way to the top, by any other means than demonstrated ability. In other words, the proposed system of promotion in the navy is a positive one, while the present system is a more or less negative one.

DISCUSSION

COMMANDER P. W. FOOTE, U. S. Navy.—There are exactly and only three methods of promotion of officers:

First: By *Seniority*. Vacancies occurring only by death or retirement for maximum age or physical disability.

Second: Promotion by *Elimination* or *Selection Out* of certain officers whose efficiency is below a certain standard. Vacancies occur through death, age and physical disability, and a certain number may be mandatory by law, as was the case in the former selection out law, known as the "Plucking Board" system.

Third: *Selection Up*. It is contemplated in this system that the particularly efficient officers of the upper grades will be selected for promotion ahead of others on the list who are not so efficient. Vacancies occur through death, age and physical disability. This is the present system now in effect in the navy covering the promotion *from* ranks of lieutenant commander and upward.

In each one of these systems there are advantages and disadvantages. We have followed for certain lengths of time each one of the above-mentioned systems, and this experience has demonstrated that in each of these systems the disadvantages greatly offset the advantages obtained.

It appears that by adopting a system which would be a combination of the three systems we might obtain more satisfactory results than have been obtained by following any one of the three systems.

The above paper by Lieut. Commander Vossler, U. S. N., outlines a plan which is a combination of the methods followed in each one of the three systems. In this method a board of nine rear admirals would be appointed as is the custom at present and generally known as the Selection Board. This board would be directed to take under consideration the fitness reports of the officers in the grades of lieutenant commander, commander and captain, and would be directed to examine these reports and to recommend for retirement those officers in these grades who did not measure up to an established standard of efficiency. In other words, they would select out those officers whose records of service show them to be unfit for promotion, if such were found to exist. There would be no mandatory number required to be eliminated. The action taken would be governed entirely by the merits of each case. The board would also be directed to select for advancement to the top of the list of their respective grades, those officers whose records show them to be particularly efficient and outstanding in their performance of duty above others in their grades. These exceptional officers would be placed at the head of the list of their respective grades, lieutenant commander, commander and captain.

The officers on these lists, as re-arranged, would then be promoted by seniority to fill vacancies existing.

This Selection Board would be required to meet once or twice a year, as the circumstances might require.

The net results of this system would be that:

First: Those officers who have not measured up to the requirements would be eliminated. This elimination would thereby produce a certain number of vacancies and increase the flow of promotion.

Second: Those officers who are really particularly meritorious and outstanding in their efficiency would be given rapid advancement over officers of average or mediocre ability. This would finally result in having a certain number of officers in the admirals grade of exceptional ability and of desirable age from which the department could choose the officers for assignment to the positions of major responsibility in the navy, and this is one of the principal things primarily intended through the system of so-called selection.

Third: The officers of average ability would be insured of reasonable promotion and would not be constantly confronted with the danger of being retired from the active list through some unfortunate accident of their service. In other words, the average man would plug along with reasonable assurance of promotion, although at a slower rate than that of the exceptional officer.

Fourth: This method would not result in officers of good records being eliminated or selected out simply to create vacancies, as was the case in the selection out and "Plucking Board" system.

Fifth: The system would be flexible and would place promotion more exactly on the merits of each case than has existed in either one of the three systems which have been followed.

The present system of forcible retirement when reaching a certain maximum age in grade would be retained.

In order to allow each officer a certain control of his career and choice of action, voluntary retirement would be authorized for all officers who have performed ten years' service as a commissioned officer, the officers retiring voluntarily being allowed two and one-half per cent of their pay for each year of service as a commissioned officer. This would aid in increasing the flow of promotion, as those officers who would find that their chances of promotion were not good for some reason or other would be willing to retire if they could be assured of a small income which would enable them to go into civil life and start their careers all over again without having to face conditions which would otherwise seriously handicap them in the support of themselves and families during this transition period from the profession of a naval officer to that of a civilian.

The cost to the government of this provision would be comparatively small and would be well offset by the general resulting efficiency which would be accomplished. It is not likely that many officers would voluntarily retire with the minimum allowance of ten years' service, the average would probably be nearer that of 20 years' service. Therefore, this provision for officers would be in keeping with the present law which allows enlisted men to retire or to be placed in the fleet reserve list, which results in the same thing, after 16 years of service. This provision of voluntary retirement with a small rate of pay has been recently incorporated in the law controlling the reorganization of the army, as passed by the last Congress.

To further summarize the ends to be accomplished by the proposed system, would be as follows:

- 1 The really unfit officers would be eliminated.
2. The exceptional officer would be given rapid promotion.
3. Officers of average ability would be given slow, but sure promotion.
4. An officer not satisfied with his promotion could voluntarily get out.

In my opinion the general net results would be a very great increase in the general morale and contentment among the officers of the navy, as they would know that their future careers were either assured or at least they would have a choice as to their future which they could make without serious loss. This would, therefore, largely eliminate the "sore spots" now existing at the top of the grades of lieutenant commander, commander and captain, where a number of officers have been "passed over" for promotion a number of times, but under the present law are forced to remain in the naval service until they reach the age of retirement in their respective grades. These officers are naturally discontented and their complaints and grievances have a demoralizing effect among officers and personnel as a whole. Under the plan proposed, those officers who are not satisfied could get out, thus removing the complaint that they have no choice under the present system.

The merits of this proposed system will become particularly evident when the total number of officers, as allowed by law in all grades, have been obtained. When under any system of promotion the general flow of promotion necessarily becomes slower than has been the case in the past four years when promotion in all grades has been greatly accelerated by the great

increase in size of the navy, as authorized by the law of August 29, 1916, and succeeding laws. This is so because although the general flow of promotion will be materially decreased, yet a means will be readily available whereby the exceptional officers may be given rapid promotion and the government can have the body of officers at the top if the list of marked ability and of such an age as to be able to perform the duties of major responsibility with the highest degree of efficiency, and this result will be accomplished without having to pay too great a price in dissatisfaction and discontent among the general body of officers as a whole. In other words, it would come nearer producing a "square deal," both to the officer individually and to the government, than under either plan heretofore devised, or probably can possibly be accomplished under the conditions which necessarily exist in connection with the promotion of officers in the naval service.

COMMANDER W. C. BARKER, JR., U. S. Navy.—This scheme combines all three promotion systems, each of which has been tried in actual operation and each of which has failed in one or more particulars.

It is my belief that the seniority system adversely affects quite a percentage of our officers, namely those few of unquestioned superiority and that other larger class, comparatively small, however, of well-known inferiority. Probably 98 per cent of our officers after reaching the grade of lieutenant commander may be included in a class of hard-working, able and conscientious men, few of whom should be lost to the service. A system of seniority promotion which operates on this large class can result in no great harm to the service.

In order to incorporate the principles of "selection up" and "selection out," both of which are admirable theoretically, in that one frees the service of well-recognized incompetents and the other of which opens the door of opportunity and advancement to the exceptional officer, those systems should be included in the combined scheme but limited in scope.

This paper proposes such a scheme, and in general seems to solve the problem of promotion. The great objection to it lies in the inevitable "hump" which will result after the number of officers allowed by law is reached, after which the only vacancies that will occur will be those due to retirements, resignations, death and selections out, a total comparatively small. A number of graduates from the Naval Academy equal to the above total of vacancies would be taken in each year, the remainder of each class to be discharged.

It appears to me that one of two evils must be accepted in any promotion scheme, namely, either a "hump" or a transfer of a large number of useful officers to the retired list. Commander Vossler's scheme accepts the "hump" as the lesser of the two.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WHAT IS THE MATTER WITH OUR NAVY'S RADIO?

By LIEUTENANT BOWDEN WASHINGTON, U. S. N. R. F. (Inactive)

The writer's naval service was partly ashore at navy yards and partly afloat attached to the commander-in-chief and to various force staffs for radio duty, and I have been at sea in practically every class of fighting ship, including airplanes and submarines. I therefore feel that I had a better than average chance to obtain an excellent "cross-section" of the radio situation, both as regards personnel and matériel. I became interested in amateur radio very early in the game, having what I believe to be one of the first amateur equipments in this country in 1903, and have been engaged in the practice of this art as an amateur and then as a professional ever since. I therefore cannot but feel that I have had the requisite training to make use of my opportunities for observation.

What is the matter with radio in the United States Navy? A great many officers will deny the implication, but I cannot but feel that these denials will not stand before the facts, and that they can be answered by the answer to one question: *Is our radio service absolutely reliable?* If anyone doubts that we have dropped behind our proper place in this art, he need only make comparison with the "W/T" service of the Royal Navy. A few such comparisons I will draw as we proceed.

First let us take up the engineering situation as it seems to-day, which is, of course, the kernel of the whole matter, for without adequate apparatus adequate results cannot be expected.

The engineering responsibility in this subject seems to fall between officers and civilians—largely on the latter perhaps, and for this reason let us first speak of them. The theory that civilian

experts should be employed undoubtedly has its sound points, but it is impossible to obtain really first class civilian experts at the salaries the Department is able to pay. In time of peace no man is going to serve the government for, say, \$3600 a year, when he can easily command twice this sum outside. Several splendid men have been lost to the Department lately for this reason.

It does not seem to be thoroughly realized that there are not 20 first-class radio engineers in the country to-day—and that even good installing men are scarce. This is a very new art, with very limited personnel.

There is also the objection that most of these civilians have been at sea very little, and have little or no idea of the practical difficulties encountered; the vibration which the apparatus has to sustain when installed over the screws of a destroyer; the whipping of topmasts and shock of gunfire; the corrosive effect of salt water and funnel gases; and above all the seemingly inevitable mistreatment to which the apparatus is subjected. As an example, I have seen a radio compass coil in a more or less exposed position designed with 124 unsoldered connections, and iron washers used at that, connected to the most easily disturbed piece of apparatus extant—the audion. Would anyone having any experience with the corrosive effects of salt water perpetrate such a piece of designing?

There are a great many civilians in the Department who are capable, *if checked by an engineer*, of doing excellent designing, but who at present seem to have no one of real engineering ability over them, and are, therefore free to make unlimited small mistakes. I call to mind a certain piece of apparatus, mechanically well made, consisting of a single series circuit. Part of the conductor in this circuit consisted of a copper bar 1" x $\frac{3}{8}$ " while part of the circuit was of wire about the size of a pencil lead. It is obvious that this is about as sensible as running a 14-inch steam line 90 per cent of the way to the main engines and ending up with 1-inch gas pipe.

Another example of insufficient engineering supervision is the average navy yard "radio gang." The writer has spent a good many continuous 24- and 36-hour periods ripping out and re-installing the main radio installation aboard various destroyers at

sea, not because the installation was poorly made but because the work was done in such a manner as to *render the apparatus inoperative*.

This sort of thing rarely happens with guns, engines, or ammunition hoists. Why should it happen with radio? Surely it must be admitted that we know enough about the art to install well-known types of apparatus properly.

The radio matériel officer at one of the larger yards remarked to me a few days ago that he had never received a wiring diagram that was perfectly correct—an undoubted exaggeration, but from my own experience containing too much truth to be funny.

Next the officers. We have a few officers—Naval Academy men—who have received a basic engineering training, and who have taken postgraduate courses in radio. These men have the right basis on which to build, but are they kept at radio? Rarely.

One of these officers who has the makings of an excellent radio physicist was "head of a department" afloat during part of the war ("gunnery" I believe); later a force radio officer, a largely executive job, and now holds a somewhat similar post ashore. Is not this a waste of good material?

We have some other officers who have come up from the ranks, some of whom have done splendid work, especially as their allotted tasks were often beyond their capabilities. These officers often lack the ability for sound basic reasoning that a knowledge of physics gives, and are therefore inclined to go about a research on the "try anything once" basis instead of first laying out a program based on constructive reasoning, and even if the solution is arrived at, the reason for this solution is often not. The chief petty officer, the electrician, the installer, is not in general an engineer or a physicist, and the only reason that I can see for this belief is that in the early days of radio, he knew as much as anyone, which was very little, and the halo has clung. One cannot imagine a civilian organization giving a good electrician or a good foreman, no matter how good, original research to accomplish.

As for the enlisted personnel, they seem frequently to have very little conception of the elements of the theory of their subject—and very little means at hand for learning it. I do not want or expect a chief electrician (radio), to express the theory of impulse excitation mathematically, but I do expect him to be able to tell

me in plain language the four reasons why a quenched gap quenches. There is too much "dope," if I may use this word to express incorrect theories, conclusions drawn from false reasoning or incomplete facts, etc. As an example—a chief tried a very small antenna for receiving a short and rarely used wave length. It naturally functioned better than the large antenna at *this particular wave length*. The next thing was a letter to the force commander from the ship's "radio officer" telling of this marvelous discovery of efficient reception on all waves and begging to recommend the adoption of this "device" by all the ships of the force.

Turning to the apparatus itself, we do not seem to always have adopted the best engineering principles. After all, what is engineering but getting maximum results under any given set of limiting conditions with the least expenditure?

We adopt types frequently after inadequate or inconclusive tests. I have seen a so-called comparison made between two transmitters—from different craft on different days, with different receiving apparatus and different operators. (The same sort of thing was done recently on some static prevention tests.) Any one of these factors might make a 50 to 300 per cent difference. Would it be logical to test two types of service rifles: one from a machine rest, indoors, with hand loaded ammunition, the other "off hand" on a "puffy" day with service ammunition, and make a direct comparison, or for that matter, could any conclusion be drawn? When there are 20 dependent variables and one wishes to determine the relation between two of them, it is just as well to see that the remaining 18 remain fixed if one's conclusions are to be anything but worthless.

We have adopted a type of transmitter which is probably the most efficient of its class and by efficient I mean only that its output compares well with its input, but it has two great military disadvantages. It requires a rather high standard of ability among the enlisted personnel—and it "shock excites" any nearby antenna so as to make simultaneous operation of one or more stations on the same or nearby ships almost impossible. (I will say in passing that the type of apparatus I design and manufacture is if anything more of an offender under this last count—so it will be seen that I have no axe to grind. This, however, is not a disadvantage to merchant ships which do not sail in formation.)

The British use a strong rugged type of transmitter about half as efficient—but not open to either of these objections. Therefore they can work two or more independent stations on the same ship. Does not this seem better engineering? After all, if there are real advantages to be gained, why consider whether the radio set takes 10 instead of 5 kw. from the ship's source, which is probably from 50 to 600 kw.? This is probably partially the result of relying somewhat on civilian engineers outside the department who have no conception of naval problems.

Another interesting comparison is to be had in receiving apparatus. We build a single cabinet containing all the necessary gear. Very nice and very pretty when it is the latest thing out. Very inaccessible if there is trouble, with all the wiring neatly concealed. If one part—an inductance say—is found later to be capable of a 5 per cent or 10 per cent improvement, this cabinet set, costing perhaps \$400, must either be scrapped, sent to a navy yard to be rebuilt, or be 5 per cent or 10 per cent behind current knowledge. If a part is destroyed, it is usually a machinist's job to replace it.

The British, on the other hand, build up a sort of panel of separate units. If a unit is improved, a new one can be placed in service in a few minutes. The same is true in case of a breakdown. The wiring is all in front, of heavy copper rod enameled in various colors for the various circuits. A glance can tell if there is wiring trouble, and if trouble in any circuit is presumed to exist that circuit can be followed by its color without the aid of a blue print, and each unit in the circuit tested and replaced where necessary.

This procedure also gives the operator a greater chance to become familiar with the circuits of his apparatus, for they are always in front of him. It may entail a slightly greater first cost and a little more work on installation, but it seems more than worth it.

The British enlisted radio men are trained to do what they are told and to do it correctly. They are not given a chance to do experimental work of their own nor to form incorrect theories. (The long enlistment may help in this.) Your plugman and trayman knows his job and does it. He does not worry about exterior ballistics. I doubt if it would help the turret crew much if he did, but he is given apparatus which works every time he asks it.

Among other things attained by this attitude among the enlisted personnel of carrying out existing orders rather than formulating their own, is that when a British operator is guarding (listening in on) say 600 meters, he is *on* 600 meters and will hear anything on that wave that occurs. This enables the British to largely dispense with all the calling and answering which we seem to find so indispensable, a saving in time and in interference.

If a ship is known to be within the range the message is sent and acknowledged—and that is all.

Another example is the use of only sufficient power to cover the distance easily—another obvious course toward minimizing interference. I have seen one of our ships “open up” on full power to a ship in the tail of the same column—enough power to be heard easily within a 400-mile circle.

Why this superiority? I firmly believe the reason to be a sufficiency of real experts; physicists and engineers.

What is the remedy for us? I see but one as long as we refuse to let line officers really specialize. The formation of an electrical or radio corps.

Our government, with its perpetual dread of becoming over-military, will never, I fear, allow the Department to pay high salaries to navy employees—but some men, I may almost say our best men—will accept inadequate pay if they receive with it the honor of belonging to a great service. Witness the number of naval officers to-day who could earn vastly more in civil life.

After all, we have a medical corps, and is electrical engineering any less of a specialty than medicine? Is it any less important to the service? Does it take a shorter time to master? Emphatically no. Is it fairer to expect a line officer to master strategy, tactics, gunnery, etc., *and* electrical engineering, than these same things plus civil engineering, or naval construction, or medicine?

As communications have a more direct bearing on the actual military operations of the fleet than civil engineering or medicine, I would suggest that this corps be formed largely of Naval Academy men who have seen several years' of “watch and division” duty—have perhaps taken the War College correspondence course so that they may have a broad view of the bearing of communications on naval operations in general, who have been given a three-year course at Harvard or some like school and at graduation

transferred to this new corps. We already have a few officers of this sort as a nucleus.

I would also suggest that each fleet radio officer, when relieved, be attached to the War College as aid for communications. I heard not long ago that the war games were being played based on radio ranges of five years ago. A flag officer does not go to sea without his radio officer, therefore it would seem that a school for flag officers should also have its radio officer.

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MANUFACTURE OF FOURTEEN- AND SIXTEEN-INCH
CUPRO-NICKEL ROTATING PROJECTILE BANDS
BY CENTRIFUGAL CASTING MACHINE PROCESS

By LOUIS J. JOSTEN

Fourteen- and sixteen-inch cupro-nickel rotating projectile bands are now being manufactured at the works of the George C. Clark Metal Products Company, Detroit, Michigan, for the United States Navy Department by the centrifugal casting machine process in a very successful and satisfactory manner. This process is patented by Mr. George C. Clark, president of the company, in the United States and foreign countries. The success of this process is due to the efforts of Mr. Clark, who carried on experiments for over two years before it was pronounced practical.

The making of cupro-nickel bands by the centrifugal casting process is novel in many respects, requiring keen judgment and practical knowledge. This knowledge must be gained by actual experience in the process. Details of minor importance in other lines of manufacture become items of major consideration in this process, therefore individual operations are done in a scientific way, all hit and miss methods being avoided.

The plant of the George C. Clark Metal Products Company consists of a one-story building 170 feet long by 50 feet wide, which is partitioned off so that 2200 square feet is allotted to the furnace room and the remainder for the casting and machining room. The small amount of floor space required is one of the principal advantages, other advantages being the superior quality of the castings over sand castings and the lower cost of production over forged, rolled, or extruded material.

The soundness of a casting produced by this process is far superior to one made in a sand mold, as there is no sand to wash

away during pouring, causing sand holes, or gases which cannot escape and causing blow holes. The centrifugal force acting upon the band during solidification has the same effect greatly intensified as a head placed upon a sand casting, which produces a gravity force. In this process it is practically impossible for porosity to occur, if proper care is exercised. If any dirt or impurities were given off during melting and should happen to get past the skimmer in the pouring operation, you would know in advance where to look for such impurities in the centrifugal cast band. The performance of the machine is like that of a cream separator, separating the light from the heavier elements, and as all of the impurities in the copper are lighter than the copper, they must assume the lesser radii. This actually happens and all of the impurities are to be found on the inside periphery of the band and are removed in the machining of the band. Numberless samples tested show that no such imperfections are present; on the contrary, all tests have shown the complete absence of such impurities.

Another feature worthy of mention is the cleanliness of all departments of the plant. There is no foundry sand or dust, no sandy castings to knock off the edges of the machining tools, and no sandy turnings to remelt.

On the outside of the plant is an underground reservoir, which holds 20,000 gallons of oil for use in the furnaces. A railroad siding is also provided for the loading of bands for shipment.

MELTING

Fig. 1 shows a view of the furnace room installed with three Hawley Down Draft Furnaces of 3000 pounds capacity each. The air is furnished by three P. H. and F. M. Roots Company rotary pressure blowers, size No. 2. Ordinary methods of melting are all that are necessary to melt the mixture which is composed of $97\frac{1}{2}$ to 98 per cent copper and 2 to $2\frac{1}{2}$ per cent nickel. Nothing but high grade ingot copper and the turnings from the bands are allowed as the specifications call for ingot copper of not less than $99\frac{9}{16}$ per cent purity. The nickel used is of the best and purest grade obtainable. The tapping temperature is about 2300° Fahrenheit, so as to allow for a casting temperature of 2150° . The correct pitch of the metal is tested from time to time before

the metal is tapped by means of buttons. Care must be exercised to see that the oil that is used in the furnaces is of a proper analysis, as to its sulphur content.

Handling of the metal is one of the most important features connected with this process. Positive methods must be employed that will permit the band to be cast at the most desirable temperature. This is a very important point, for if the casting tempera-

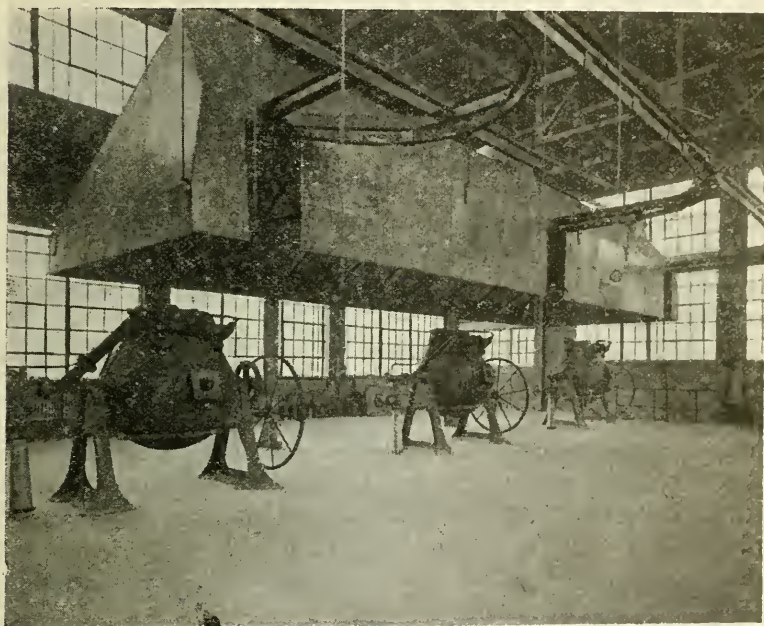


FIG. 1.

ture is not correct, the physical tests will fail, rejecting the entire heat. It therefore becomes important that the casting room have a sufficient number of machines in operation to permit of the removal of the metal from the furnace in the shortest time possible, after it has been brought up to the proper pitch and temperature.

The three furnaces are melting about 20,000 pounds a day. The ladle receiving the metal from the furnace is of a capacity sufficient to pour three bands. It is hauled to the casting room by means of an overhead trolley system. Extra precaution is taken that the metal does not oxidise on its way to the casting room.

DETAILS OF THE CENTRIFUGAL CASTING MACHINE
CONSTRUCTION

Fig. 2 shows one row of casting machines, there being two rows of three machines each. The principal parts of the machine are the die and die holder, the movable spout and the metal pouring attachment. The die and holder are driven by a shaft, to which is attached a foot lever brake controlling the speed of the die and holder. The speed of the machine varies with the size of the die used, being about 1050 r. p. m. for the 14-inch band. The holder is made of plain carbon steel, while the die or liner is a forging, with a special heat treatment and held in place by means of six set screws. A hinged cover plate of the same diameter as the holder and having an opening large enough to accommodate the pouring spout, is made to open and close on one side of the die and holder. This cover plate prevents the metal from running out of the die during casting. After the band is cast and has been cooled sufficiently, this cover plate is unscrewed and the band removed from the machine.

The life of a liner is such that about 250 bands can be cast before it is burned out and has to be replaced.

All revolving parts are made in absolute balance. This is most important, for if they were not, one can readily see what influence this would have upon the product. The two masses in high rotative velocity would be assuming two radii of gyration, causing the mass of metal to change its relation with the periphery of the liner while still in a molten state, thus causing uncontrolled contractions in the castings.

The pouring spout and metal pouring attachment is made to move upon a V-slide. The position of this spout is most important and should be such that it delivers the metal to the periphery of the liner without excessive splashing. This spout is not permanently attached, but is made to raise and lower for the purpose of movement in or out of the die. The spout is supported near the pouring lip by a rod. Trunnion bearings made of strip steel and placed in line with the spout are constructed on each machine to accommodate the tilting of the pouring ladle.

Each machine is equipped with an air hose to clean off all particles that may adhere to the die and cover plate after casting. A water pipe is constructed on each machine so that the pipe may

be adjusted by hand to supply water to the die during casting for annealing purposes or bent back out of the way when the machine is not in operation. A drain pipe carries the water away from each machine. A sheet iron shield covers the die and holder to prevent excessive splashing of water or metal.

CASTING

In preparing the machine for casting, the cover plate on the side of the die and holder is unscrewed and let down. The air

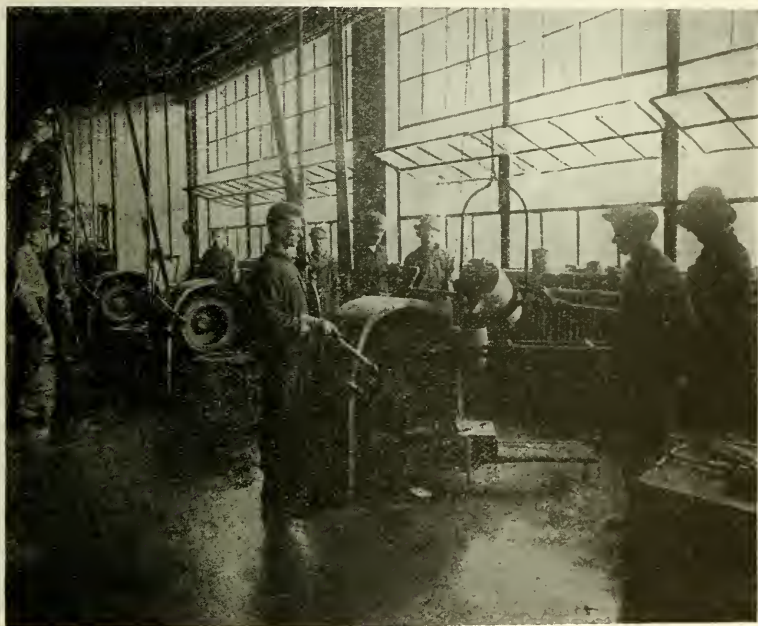


FIG. 2.

hose is used then to remove any foreign substance that may adhere to the die or inside of the cover plate. The die and the inside face of the cover plate are coated with plumbago and after the cover plate is screwed in place, powdered talc is sifted very lightly on the inside of the die to keep the metal from sticking to the same. The pouring spout is also coated with plumbago. The machine is now made to revolve and the spout is moved forward so as to deliver the metal to the die. The metal is brought from the furnace room in a ladle of three times the capacity of the small crucible shown

on the machine in Fig. 2. The amount of metal poured into the small crucible on the machine is sufficient, as shown by experiments, to allow the band to be cleaned up in machining. The metal is now ready to pour. This is done by tilting the small crucible on the machine so that the metal will flow through the spout into the die. While the machine is still in motion, the spout and crucible which move upon a V-slide are pulled back out of the way. When the band shows the desired color for

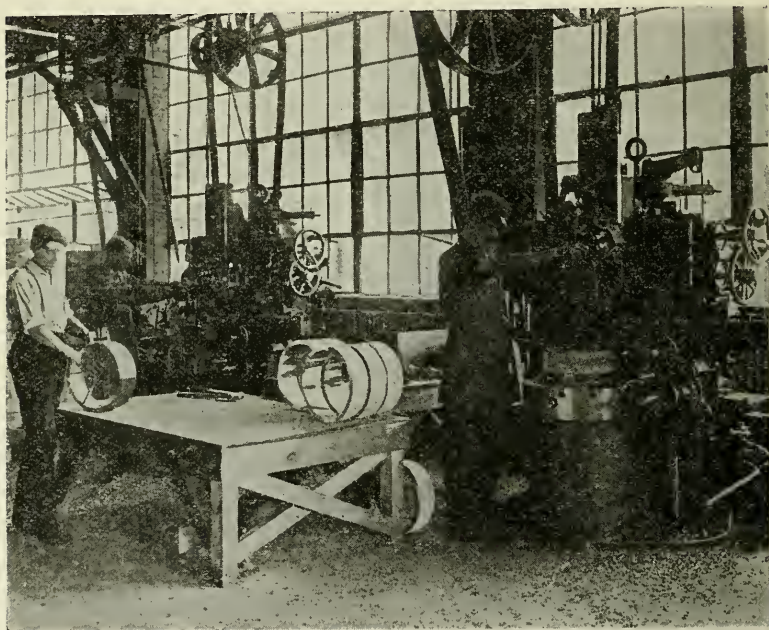


FIG. 3.

annealing, a stream of water is turned on the band through a pipe. This pipe is adjustable by hand so as to place it in the correct position. This feature saves considerable time and expense as the band is annealed by its own casting heat. After the band has sufficiently solidified and has received its proper annealing, the water pipe is taken back out of the way so the cover plate can be unscrewed and let down to allow the band being removed from the die. The band is then weighed to see that there is sufficient metal to allow for the band cleaning up. The casting date is

stamped upon each band, for instance 7-2-3, which denotes that it is the third heat of July 2. The date of casting and heat number are put on each band so if this heat fails either as to chemical analysis or physical tests as required by the specifications, it can be identified and rejected. After the band is cast, it is necessary to keep the lip of the pouring spout clean, as a certain amount of metal clings to its sides and has to be removed by hand with a chisel.



FIG. 4.

MACHINING

Fig. 3 shows two Bullards in operation, one for machining the inside of the bands; the other, the outside of the bands. There are only three machines necessary to completely machine the bands, namely, two Bullard vertical turret lathes and an ordinary engine lathe. The first operation in the machining of the band is done by placing the band in the engine lathe to remove the large fin which forms on the inside of the band during casting shown in the rough band in the right foreground of Fig. 4. The

second operation is set up on the first Bullard for machining the inside of the band and the top face of the band. The fixture made to hold the band for this operation consists of three steel castings which are individually screwed down to the chuck of the machine so as to move universally when tightening or loosening one of the chuck screws. The band now moves on to the second Bullard, which is set up for machining the outside diameter and the reverse face of band. On this set-up, the band is held in place by an expansion toggle joint chuck made in three parts. The sharp edges of the band are rounded off. The band, now being completely machined, is moved on to the inspection bench to inspect for surface defects and check up for gauge dimensions. The tolerances allowed by the government in machining are very liberal, being twenty-five to thirty thousandths in most cases. A small auxiliary machine shop is operated in one corner of the building for machining the dies, holders and tests.

TESTING AND INSPECTION

Two physical tests are required to pass a heat of bands, one being taken from the beginning of the heat; the other, at the end of the heat. The test pieces are machined to a size designated in the specifications, namely, $1\frac{1}{2}$ inches wide by $\frac{3}{8}$ inch thick. The elongation is taken over a 3-inch length. The physical requirements are as follows: Tensile strength 30,000 pounds, minimum; elongation, 30 per cent, minimum; reduction of area, 35 per cent, minimum. In the selection of test pieces, this process is at a disadvantage over other methods as there is no way of obtaining test pieces without destroying a good machined band, as each test selected has to go through the same process of manufacture and heat treatment as the bands that it represents in the lot. The band from which a test piece is to be cut out is first taken to an arbor press and flattened down to an opening of about five inches. Then a piece of sufficient length for a test piece is cut out from the flattened side in a high speed cut off machine. The tests are then finished to the correct size and shape in a shaper. The remarkable ductility of rotating bands made by the Clark process is greatly in favor of this method of manufacture, a large number of tests for elongation and reduction of area having averaged over 45 per cent above the navy requirements. A chemical analysis is required from each heat also.

Occasionally, the manufacturer makes special tests, not required by the government, for his own benefit or information. Several bands have been taken and flattened out upon the inside periphery of the band without showing any signs of fracture at the edges; others have been bent back on the outside periphery of the band with closely the same excellent results.

The inspection of the bands consist of an inspection for all surface defects and the gauging of all the machined surfaces with gauges of a "go" and "no go" tolerances. When a sufficient number of bands have passed inspection, including the physical and chemical requirements, they are loaded and shipped to destination. Each band is marked with a government stamp to show that they are accepted.

This process on account of the rapid production possible with the centrifugal machine and the fact that unskilled labor only is required for its operation, has solved what was heretofore a serious handicap in the country's production of large projectiles—viz., the manufacture, in great volume, of rotating bands in the large diameters—and is capable of quick extension of production facilities if necessity should arise.

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THE COMMANDING OFFICER, RECRUITING OFFICER,
AND MEDICAL OFFICER *VERSUS* DESERTION

By CAPTAIN J. S. TAYLOR (M. C.), U. S. Navy

THE COMMANDING OFFICER AND DESERTION

It may seem presumptuous for a medical officer to venture suggestions on such a topic, even though himself subject like every other component part of the naval personnel to discipline and under solemn obligation to promote it by every legitimate means. This paper was originally prepared at the suggestion of an officer of the line of the navy and the statistics are derived from an able presentation of his study of desertion submitted by Lieutenant R. E. Parsons, Medical Corps, U. S. Navy, to the Sixth Division of the Bureau of Navigation. Having been for 22 years a member of the naval service, a deeply interested observer of its growth and development and a constant student of human nature the following remarks are offered not in a spirit of hostile criticism but as perhaps possessing some value because, coming from "a looker-on in Vienna," they represent a different angle of vision.

In every branch of human activity there are certain guiding principles, certain moral and philosophical considerations underlying conduct. The successful administrator must fully understand these latent but compelling forces. The administration of discipline and the control of military organizations cannot be highly effective if it is done in a mechanical way; if justice is to be dispensed there must be full appreciation of the reason for as well as a knowledge of the provisions of the law.

The Articles of War and Navy Regulations, indeed the whole structure of discipline and military life are built on a profound knowledge of human nature. For example the force of habit, the instinct of self-preservation, gregarious tendencies, the spirit of emulation, all of which are exhibited in varying degree by animals

as well as man, are utilized in training the units to be combined into an effective fighting force. Daily repetition of certain complex and difficult movements makes them easy; regular experience of alarming or dangerous situations robs them of their terror; rewards, promotion, honorable mention, medals and ribbons, distinctions in rank, insignia and uniforms, the change from dirge to quick march when the funeral is over have their justification in man's ambition, his inborn inclination to hero worship, his deep-seated respect for power and authority and the necessity of playing the game in spite of sorrow and calamity. The recruit is subjected to sights and sounds, surrounded by an atmosphere, initiated into a mode of life calculated from a knowledge of human nature to mold him to a desired type and the rules of military service embody in practical form the sum of observation and experience along these lines.

The cardinal error of many persons vested with military authority consists in losing sight of these basal facts. They accept the stereotyped regulations of the body to which they belong not as an epitome but as an encyclopedia. For them the regulations represent the first and last word, the embodiment of all duty and responsibility and a complete guide to conduct. Such men are not apt to be successful disciplinarians in the best sense. With them there is little chance for progress and development either of the individuals under them or of the organization as a whole. They follow the letter of the law to the neglect of its spirit and intent; they carry out the regulations but ignore the human nature on which the regulations are founded.

The majority of military commanders fall into one of two great groups; the mechanical and the spiritual. The mechanical disciplinarian is always within the letter of the law. He has, of course, never knowingly "incited a man to desert" and would be highly incensed at the suggestion of such a thing. His conduct is technically unimpeachable; no flaw can be found in his knowledge and interpretation of the regulations and no court could ever incriminate him. His officers and men comply outwardly with every law and requirement but the former are dissatisfied and the latter desert. His iron inflexibility, his excessive zeal for order, his attention to detail destroy individuality, smother ambition, benumb effort in his subordinates and divert him from functions of a higher order which are the peculiar field of the officer of com-

mand rank. One of these is to reason out the moral factors bearing on military life. Without realizing it he is himself a disintegrating factor in a body which needs above all else to be unified, consolidated and cemented together. Himself upright, he is nevertheless a stone of stumbling and a rock of offense to others. He passes with skirts unsoiled from promotion to promotion but leaves behind him a trail of wrecked lives and unhappy ships. Living according to the letter of the law and exacting its minute observance by his subordinates, his conscience acquits him of wrong, but he may have sinned daily and hourly by all that he has left undone in domains where the law could not condemn him because these fields of action are beyond its exactions: he treats men as machines, yet demands of them the fruits of the spirit—patriotism, self-sacrifice, courage, devotion to duty.

The spiritual group includes men who at any given moment of their careers could perhaps be proved guilty of some minor infraction of regulations but who lead happy and useful careers and have happy ships and efficient crews. With them regulations and instructions are not like mathematical theorems or the laws of chemical combination. They recognize that while chlorine and sodium in certain definite proportions always combine to give a definite weight of common salt no such formula for conduct is applicable to men. The "human element" is ever uppermost in their minds. Not the law's observance but the accomplishment of the law's ultimate purpose is their guiding principle. They require all men to be in uniform but do not allow themselves to forget for a moment that identity of externals does not assimilate individuals or obliterate marked variations of personality. The culprits brought before them in the administration of justice are not viewed by them as mere cogs in a wheel but as plastic material that must be so handled as to be welded into conformity with the most comprehensive aims and purposes of the ship and the service.

The commanding officer, who administers his ship through trusted and competent heads of departments, has under his direct observation his officers, his orderlies and the quartermasters and helmsmen, but at drills and maneuvers and in the ordinary day's work the bulk of the crew are merely groups of men seen *en masse*. It is mainly when infractions of discipline occur that the captain of a ship comes into contact with his men as individuals and the

administration of justice on such occasions is at once the most difficult and the most important of his many and onerous duties. It is one which cannot be performed in arbitrary and perfunctory manner because, though the law may be satisfied, failure to consider both the spirit of the law and the spirit of the offender will produce the most widespread and disastrous effect on the entire personnel.

Offenders are either occasional or habitual. Young and inexperienced must be the officer who fails to distinguish between them. Rare indeed is it to find a captain who would not assign a different punishment for the first offence and the fifth. To waive punishment altogether for a first offence is often the part of wisdom if a consideration of the culprit and the attendant circumstances seems to put the offender into the occasional, the offence into what might be termed the accidental class. These well-established distinctions are important and referred to here because they illustrate a discriminative, selective action which should go further than it does and be far more general than it is. There should be a distinction, too, between the violator of regulations and the offender against the fundamental laws of society. The man who steals a watch commits the crime of theft and at the same time is guilty of a deed peculiarly opprobrious because of the conditions under which men live aboard ship. The man who thoughtlessly violates the sanctity of the quarterdeck or the tenets of the sea, as by whistling, is in another class. Yet on at least one occasion these two offenses were punished in an identical manner with disastrous results to the morale of the ship. The minor culprit conceived that he had been punished as severely as the common thief who preceded him at the mast. He went away with a grievance. The rankling sense of injustice made him a potential deserter and did the same for the man who had been robbed. As a matter of fact the captain gave the whistler or loafer a legitimate but maximum punishment. In the case of the thief there was no doubt of the guilt but there was lack of proof and the error of judgment lay in assigning a trivial punishment rather than none at all for a major offense when the two incidents were so conspicuously juxtaposed. The interpretation put on the captain's action was a false one. The crew decided that he deemed whistling on the quarterdeck over his head an offense of equal magnitude with the theft of a poor enlisted man's watch. This was doing the captain a great

injustice but he would have been wiser, as well as in keeping with strict judicial procedure, to let the thief go unpunished in view of the lack of proof. The occasion might with propriety have been marked by a thoughtful comment on the heinousness of theft aboard ship and the reason why the suspect did not receive punishment and what an adequate one would be.

In a general way our enlisted men appreciate justice and accept without a murmur the proper legal punishment of their misconduct but let there be with the award a conspicuous manifestation of other than judicial bearing and deep discontent with incalculable consequences follow. Discontent cannot always be prevented. There are men who are never satisfied and the more they receive the less they give. To coddle and pamper men with the idea that they will be happy and so do good work is the most fatal of errors. The happiness which promotes production is that which flows from tranquillity of spirit and complete harmony with associates; from fitting into the position assigned. To make a pet and a favorite of a man spoils him and tends to general disorganization because it is bound to destroy harmony between him and his fellow workers who envy him though they may not themselves desire to be petted.

The lowest of men recognizes in a dim way that he has a something called soul; he must be very far along the road to perdition before he loses all sense of what is due him as a mere man, before he will endure certain indignities intolerable to a human being regardless of his calling, his rank or his status before the law. That is why flogging was such a failure as a disciplinary measure. Men bore the pain without flinching but their souls were wounded beyond recovery and the cat-o'-nine-tails bred hatred, rebellion, mutiny in those who endured it and in any man of spirit who witnessed the ordeal.

As the type of man coming into the navy has become steadily better and higher so it has become necessary to dispense with every form of punishment for mere infractions of discipline which was in any sense degrading, and the fine and reduction in rating with consequent loss of pay have largely superseded the brig which to the sensitive soul was like a cage for an animal. The reader who recalls some of the rough characters that have passed in review before him in the navy may smile at the expression "sensitive soul" but it is the sensitive being from whom may be expected

the sublime deed of valor and heroism, the self-sacrifice, the unswerving loyalty, the unreasoning daring that crowns our flag with glory and makes the navy the true school of citizenship. We must preserve, modify and utilize men's sensibilities, not obtund and stultify them. Quick reactions in emergency are not to be expected from the callous; those whose feelings have been dulled and perverted by a lack of discernment in the controlling power are the men who desert without a blush or put self before duty in moments of grave peril. Irons single or double have been wholly discarded. To humiliate a man by creating in him a sense of the seriousness of his offense is legitimate: to humiliate him by a degrading *form* of punishment is to crush out his spirit and ruin him and some of his associates forever. We want men of spirit not galley slaves in the navy and the best captain is he who knows how to develop capacity, enterprise and daring; whose punishments awaken and quicken instead of deadening the human spirit. The hectoring, bullying, swaggering, choleric captain may survive in fiction but there is no place for him on an American quarterdeck. Even the commanding officer who indulges in biting sarcasm, who withers the culprit with his contempt and makes him cower before a haughty, heartless demeanor is guilty of a serious error for such conduct begets bitterness. Often it is not the law's sentence but the semblance of a sneer accompanying the verdict that leads to desertion.

A certain captain returned one night to his ship and was horrified to find a member of the crew sunk in a drunken slumber on his erstwhile inviting brass bed in a cabin that he had left immaculate but was now filthy and disgusting. The captain was naturally indignant and what passed between him and the sentry is not known but his handling of the situation was remarkable. Needless to say that by "turn-to" in the morning the incident was known all over the ship and everybody was on the tip-toe of expectation about the fate of the unfortunate man who under the influence of liquor had violated and defiled the sanctity of the captain's cabin. At the proper time the offender was brought to the mast, sentenced to five days in the brig for returning to the ship intoxicated and dismissed with a simple but emphatic reminder that liquor often leads a man to make a fool of himself. There was not a reference to the invasion of the cabin, no hint of *lèse majesté*.

The effect of this impersonal treatment of the affair was enormous. The man remained on the ship two years and never again took a drop of liquor in that time. The captain had reformed him and he acknowledged the fact gratefully. As for the crew they were more than ever the loyal and devoted admirers of their commanding officer whose methods were novel but effective and well illustrated by the incident cited. There were many irregular things on his ship but they were constructive and not destructive. He wanted his officers and men to be efficient; was not satisfied with the routine performance of duty, with the minimum that could be regarded as satisfying the regulations; exacted all that the regulations were designed to secure. His ship was a happy one and a smart one too.

It would be unpardonable to intimate that a commanding officer is ever intentionally partial but it is true that conditions often prevail on a ship that, to the enlisted men, suggest partiality and the practical administration of affairs sometimes lends considerable color to the suggestion. This breeds the kind of discontent that makes for desertion. The better the man the more intensely he resents anything that savors of injustice and once the idea that he is victimized in favor of another takes root in his mind he becomes a potential deserter whom the merest trifle may convert into an actual one. Yeomen, cabin and ward room stewards, the men who come into most frequent and direct contact with officers so that they are better known and have their good qualities more highly appreciated are very apt to receive special privileges. This may be right enough in one way but it is a policy of doubtful wisdom.

In general there is no greater promoter of sound sleep than the tonic of work. This is universally recognized and to keep the men busy is generally accepted as the best recipe for contentment but there is such a thing as overdoing this. Unless the idea is carried out with tact and judgment it may be productive of harm. There is usually enough to do on a ship or at a station to keep all hands reasonably busy if inspections of compartments, magazines, storerooms and living spaces, etc., are rigid and a high standard of cleanliness is insisted on. Men are very quick to discover it when work is simply manufactured for them after the regular requirements have been met and they deeply resent such a policy. If

the upkeep of a ship or station and the training of the crew do not absorb all the time available what remains should be assigned to legitimate recreation planned and supervised not so openly but with as much care and forethought as is expended on any feature of duty. The point is to have men occupied. It is idleness, not leisure, that does harm and the spare hours devoted to athletics, dramatic performances, games, etc., are fully as useful in promoting a proper frame of mind as work and infinitely more salutary than an excess of work which appears unnecessary to the crew and often is unnecessary and irksome. The ship that coals on Sunday when other ships are sending hundreds of men ashore for liberty, while every one on board knows it is not imperative (a knowledge confirmed by a delay in sailing until Wednesday); the ship on which an enthusiastic but overzealous and indiscreet gunnery officer prolongs the drills and repeats general quarters again and again in a single day through week after week of preparation for target practice, pursuing a policy that no physical trainer would employ for man or beast; the ship on which the men have no regular definite time which they can call their own; on which their plans for relaxation and amusement are arbitrarily and summarily interfered with in times of peace without a vital and urgent necessity will not be a happy ship but one whose complement is never full.

There is no plea here for the relaxation of discipline, for condoning neglect of duty, disobedience or insubordination, but merely that the idea of discipline must be enlarged. The discipline of the modern navy includes improvement and development of mind and heart and body to mold the whole man to the purposes of the navy and the will of authority. Swimming is obligatory; so is setting up drill. Every ship has its library. A chaplain is one element of the officer personnel; so is the fleet or ship athletic officer. The high discipline is that which utilizes every measure to bring out the good in men and fend off possibilities of wrong doing. It involves forethought and constant study on broad lines.

It may as well be recognized that the era of "driving" has past; that unless the navy offers a livable and attractive program and fulfills it—one in which hard work and healthy play are properly balanced in the day's schedule—we will not get the men or, getting them, will not be able to hold them. We may punish all we please

but punishment remains largely a negative measure, an aftermath of evil with scant reforming power.

Less than a quarter of a century ago there was open mutiny on a certain vessel of the navy followed by the inevitable court-martial which awarded sentences of penal servitude for periods reaching as high as seven years. The culprits were guilty and the punishments in accord with justice and law and yet the mutiny was preventable. Two main causes were responsible for the outbreak. The crew was composed in the main of faithful, hard-working men who had experienced peculiar conditions and always responded in an exemplary manner to unusual but legitimate demands. When a period of rest came they objected to doing work which they regarded as imposed merely to keep them busy. Nothing would have come of this feeling, mainly one of humiliation, had not a draft of recruits come to the ship about this time. The new accessions had no conception of military requirements, having never been properly indoctrinated, and conceived that their situation was not different from that of the workmen in civil life who may organize, protest and refuse any employment not to their liking. The influence of this new leaven was not perceived and the inevitable happened. Had the circumstances been different wholesale desertions would have manifested the general discontent which actually took the form of open insubordination. A good rider knows better than to come to an open contest of strength with his steed and circumvents instead of trying to overpower him. The temper of the men and the ignorance of the more active fomenters of disorder among them on the ship referred to should have been perceived and their outlawry forestalled.

Many a good man deserts in a state of temporary discouragement or discontent who would not do so if he had a full sense of the gravity of the offense. This is particularly true in the case of young recruits. Not to warn them is a serious error on the part of the officer responsible for their conduct and training. The first solemn caution should be given at the recruiting office and the enlistment papers might well contain a statement over the recruiting officer's signature that he had fully explained the nature of this act. At training stations and on ships the same instruction should be given and periodically the captain himself should briefly carry home the lesson by a few judicious words.

Major General David C. Shanks (National Army) U. S. A. considers this matter to be of the greatest importance in combating desertion. He says:

In large part desertion will cease as soon as the soldier knows that he has thereby committed a crime which makes him despicable to his comrades in civil life. While I am sure that desertions in our army are largely the result of the fact that the seriousness of the crime is not appreciated by our civilian population, I am confident that the number of desertions in our army would be greatly lessened by proper effort on the part of our officers. Too many of our officers apparently go on the supposition that the only way to check desertion is by punishment after the crime has been committed and the soldier is again within military control. *They never do anything to prevent the crime from taking place.* I state it as a fact, which I believe could be established without difficulty, that a very large proportion of our men who desert leave the colors and break their oath without even having heard a single officer raise his voice to caution them against this crime. Many of our officers when asked about desertion merely state that a certain number of men have deserted and then on their part ask, "What are you going to do about it?" If any officer is satisfied to have men desert from his company without his ever having taken any steps whatever to prevent it, he has failed in his duty and he has not done what the government has a right to expect. The officer has a certain duty which he owes to himself and to his government and if he shirks it, the blame, in part, at least, can be placed upon his shoulders.

Every recruit who joins a company ought to be talked to on this subject; he ought to be instructed thoroughly by his officer as to the difference that exists between a mere civil contract and an oath of enlistment. He should understand the difference between a man who makes a bargain in civil life and then changes his mind, and the man who raises his hand and takes a solemn oath to serve his country and follow the flag, and then breaks that oath. It is up to the officer to explain this difference to the young soldier, not by long sermons, but by such brief talks to his men as will put into the company a spirit of detestation for that man who engages to serve his country and then violates his oath.

This surely applies no less to sailors than to soldiers and no less to naval officers than army officers. If commanding officers of all training units were to vigorously put into practice the recommendations of General Shanks, there would, without doubt, be a measurable decrease in the deserter roll.

One of the most difficult features of ship and station administration arises in connection with the granting of special liberty privileges to men who ask to go home on account of sickness or death in the family. Every commanding officer knows that the grounds for a goodly per cent of these requests are fabricated

and this tends to make the decision a perfunctory matter, one determined by reference to a schedule showing whether the petitioner has any furlough due him or not. The man who has offered a trumped-up story and been refused will slouch away and talk large of injustice but his shipmates usually know he has been lying and the general tendency will be to admire the officer who saw through the ruse. Where the case was a *bona fide* one the results are different and very serious. An officer must put himself in the man's place so far as he can and try to realize what it means to be tied hand and foot by military restrictions, or to be refused in an apparently indifferent, mechanical, offhand manner when the loved wife, mother or sister is sick or dying at home. He should consider the independence of conduct and movement the man enjoyed before he voluntarily placed himself under the powerful restraints of military life and realize that if the request is a proper one the chances are that the man will say to himself when refused: "I did not have to come into the outfit and I do not have to stay in it." Family ties are the strongest a bluejacket has. He will incur the gravest risks for their sake. Many an excellent man deserts when refused the furlough he sought because there is trouble at home. A thousand cases of desertion at the Portsmouth naval prison were recently analyzed by Lieutenant R. E. Parsons, Medical Corps, U. S. Navy, and showed that more than 22 per cent (228) were due to the call of sickness or death in the home, drink accounting for 38 per cent and "no reason," "wanting liberty," desire "for a good time" combined amounting to 36 per cent. Very few men but will take the law into their own hands and feel they did right in "jumping ship" in obedience to the wish of a dying mother to see her son once more.

This question of unusual furlough privilege is therefore clearly one of immense importance to the man and to the service and each case should be investigated with the most painstaking care and it would seem better to have a good many men get unmerited furlough than to deny a single meritorious appeal. Some uniform system of verifying the facts might be devised and employed as a routine measure. For example, on returning from furlough, a man might be required to produce a set of papers and vouchers stipulated in advance and failure to do so could be punished by a heavy fine not ostensibly viewing the omission as an evidence of fraud but of carelessness and neglect of the ship's regulation re-

quirements. Cases of fraud and misrepresentation can often be detected and should be punished with great severity.

The group of a thousand deserters above referred to contained 120, or 12 per cent, where failure to return was due to fear of the consequences because the man went without leave or overstayed it. Steps should be taken to explain thoroughly to every man going on leave, particularly recruits, the vast difference between "overtime" or "jumping ship" and desertion. Of course it is not practical to preach a sermon on rectitude to every man going on liberty but it is worth while to take a good deal of trouble in this matter for it saves more trouble later on. It might be delegated to the chaplain to bring out these points periodically in a sermon. A captain assuming command might advert to the subject and every man going over the side might be given a small printed slip summarizing the points about desertion, etc., until all the crew had had one liberty and thereafter every new man reporting aboard could be given such a slip at least once. Better measures than these can be devised. They are offered merely as a suggestion.

On every ship and at every station the greater part of the offenses committed can be brought home to a relatively small group of men who appear again and again at mast and are often habitual attendants at sick call. By reason of mental, moral or physical abnormalities they are wholly incapable of adapting themselves to conditions of military life and hence constitute the ship's delinquent class.

Under the most favorable conditions in civil life the shortcomings and peculiarities of such men do not attract much attention but they fail to measure up to the standards of a highly specialized life like that in the navy with its prescribed routine. Those who cannot conform to the general pattern and are constantly running foul of some provision that their biased intelligence will not accept are best disposed of at once by survey or inaptitude and bad conduct discharge in the same manner as the chronic invalid or the victim of patent and active insanity. As a matter of fact a certain proportion of all court-martial cases, and a very large percentage of men tried for desertion, have a mental defect of some kind. Thus, in the group of a thousand men serving sentences for desertion referred to above, fully 50 per cent belonged in the class of feeble-minded or showed constitutional inferiority,

constitutional psychopathic state, dementia præcox, a neurosis of some kind, paresis, chorea, neurasthenia and allied affections.

It would certainly seem the part of wisdom to require a medical officer to be present at mast, especially at training stations, so that he may study the bearing and face of each offender, hear the often remarkable excuses offered in palliation of an offense and perhaps discover later by careful study any cases of mental defect among the habitual offenders. Moreover it should be the established rule for drill officers to refer to the medical officer for study such recruits as prove hopelessly dull at their tasks, incorrigible, insolent, peculiar, the objects of general ridicule or unfavorable comment from their shipmates.

A captain should be supreme on his ship but some commanding officers wrapped around in a mantle of satisfaction at the punctilious way in which their orders are executed fail to make the subtle distinction between obedience to their orders and the fulfillment of their wishes. The captain's essential wish of course, is to have an efficient ship, one marked by smartness at drill, swift and correct maneuvers, an active, well-behaved crew, redounding to his prestige; but though his word is law he does not always succeed in getting his heart's desire. There is no way to make men reenlist against their will and on certain ships they cannot be prevented from deserting. Failure to reenlist and desertion are the enlisted man's reaction under defective discipline. The discipline may be administered in a spirit of intolerance, be characterized by high-handed methods and an excess of militarism or the reverse of all this, but unless there is in the cabin a profound appreciation of the human element, and if the ship is run without a complete understanding of the enlisted man's attitude to life and to the service, without a carefully developed policy based on a broad consideration of the times in which we live and of all the conditions that prevail, the desired results of navy training will not be obtained. Officers embarked for life in a military career are prone to forget that a certain stratum of society is made up of men who constantly shift from one occupation to another; from the automobile business to real estate, from that to life insurance, to selling goods and to an infinity of other pursuits. The enlisted man is similarly unstable, especially during a first or even second enlistment. He has no commission, no social and personal interests to hold him in the service, he has not chosen it as a career but

entered it as an experiment and is easily diverted from an employment fraught with discomforts and privations and offering no glittering reward in the future. Necessary discomforts and privations he cheerfully endures but let the carelessness or callousness of a superior impose too much and the cord that holds him is easily snapped.

The loyalty which enlisted men display when their officers are in trouble or need is proverbial. They do not hesitate in times of stress or deadly peril to risk their lives even for an officer who is personally unpopular. This is accounted for by the fact that, grafted upon the best instincts of human nature, there are feelings of obligation to the shipmate, the partner in the vicissitudes of the sea, the leader. This loyalty and devotion calls for a corresponding recognition on the officer's part of the ties that bind together those who wear the uniform of the navy. This appreciation of common interests and a common lot, as well as of a common humanity, should manifest itself not by a relaxation of strict discipline on the part of the commanding officer and his associates in authority but rather by concerted measures to render the enlisted man's life as healthy, as happy, as natural as possible under the abnormal conditions that attend seagoing, abnormalities that fall most heavily on the young and untried recruits who are also those most likely to desert.

Perhaps the most important single asset that a commanding officer can possess for wisely conducting the internal administration of his ship is such a lively imagination that he can appreciate the feelings of others when petty disappointments and humiliations occur, for when these are reiterated they cause more desertions than some great thing.

Contrary to what many suppose it is not always the officer who was once an enlisted man himself that makes the considerate commander. Too often such an one has forgotten how he used to feel or else he belongs to that class of men who conceive that as things have been so they must always be. Unless he has the qualities specified by Taine in his immortal definition—"the most perfect gentleman is he whose intelligence is most cultivated, whose heart is most devoid of selfishness"—the ex-enlisted man's rule will be less tolerable than that of the officer of very different antecedents possessed of delicate sensibilities, capable of broad concepts, surveying life on a broad horizon.

THE RECRUITING OFFICER AND DESERTION

It is legitimate, it is highly desirable, for the officer in charge of a recruiting station to wish to secure as many men as possible but he should realize from the start that for "the good of the service," which is the true life purpose of every officer, numbers count less than quality. We want good men and men with physical defects are not good for military purposes generally speaking. It is undeniable that in battle, in the ardor of attack, many a man with serious blemishes both physical and moral may make good, but there is something more trying than the day of battle and that is the long course of training with its monotonous round of daily duties, its unvarying discipline, its privations and all the artificial and unnatural conditions of life at sea.

No recruiting officer wants a blind or deaf man enlisted and he is willing enough to have the medical examiner reject exaggerated cases but he often regards his doctor as indiscreet and overzealous in turning away men with defects of a minor character and it not infrequently happens at a recruiting station that the officer in charge and the medical examiner are in constant disagreement. Young medical officers often are overzealous and older ones seem to take a delight in sticking to the letter of the law and the officer in charge thus comes to regard his examiner as a spoke in his wheel. This is unfortunate. The safe rule for the doctor is to reject if in doubt, because that represents the best interests of his employer and that employer is not the recruiting officer but the government.

It is important, therefore, for the officer in charge to have a thorough appreciation of the vast significance of apparently trifling defects. A man with a crooked nose or a facial blemish that makes him the subject of constant ridicule seems like good timber for fighting but will he be good material for four years of training and eight or twelve years of service? Now the doctor who has had experience at sea knows that three-fourths of the daily attendance at sick call is made up of men with apparently trifling defects and in 50 per cent of them the defects antedate enlistment. A coal passer with obstructed nasal passages must breathe through his mouth and that means a dry throat, catarrh and from this, perhaps, ear trouble later, etc. He is forever hanging around the sick bay or going there for treatment. A deck-force man with an old ear

trouble or weak arches does the same. He is constantly late for or absent from drills and formations and periodically he has recurrences of deafness and discharge or declares himself unable to parade or stand a watch. Such a man is a nuisance in a division and unless unusually strong in morale is apt to become a loafer and shirker.

The apparently trivial defect at the recruiting office looms large at sea and with the first chagrin, disappointment or grievance the sufferer begins to magnify it for the purpose of getting a discharge or to avoid work. Often the man with a slight defect becomes hipped on the subject and comes to believe that he has a really serious ailment and the more disproportionate to its seriousness are his fears about himself the more valueless he becomes to the service.

The recruiting officer then should fully appreciate that the capable and experienced medical examiner who turns away one good man through excess of adherence to technical requirements usually turns away 50 whom he might perhaps pass technically but for his appreciation of service conditions and the conviction that such candidates would not last six months.

It might seem the part of wisdom to accept doubtful men on a chance because they can always be gotten rid of later by medical discharge but this is a superficial view of the case. A man who has a trifling ailment or defect and voluntarily enlists with it is not entitled to be surveyed the moment he becomes aggrieved at some detail of discipline or awakes to the fact that the navy is not all he had dreamed it to be. If he is refused a survey he at once begins to nurse a grievance, he feels he has been unjustly treated and so becomes a potential deserter.

Incalculable harm is done to the navy by accepting men who must eventually be surveyed or failing that will desert. Surveys are almost as demoralizing as court-martials and desertions, because in the minds of the dissatisfied they put a premium on infirmity. They are demoralizing not only to the ship but to the public. Men who are surveyed for defects antedating enlistment or desert because of physical defects and their consequences, have usually been in the service only long enough to experience the hardship inseparable from all beginnings and new enterprises and not long enough to appreciate the good features of the service. In the home communities to which they return, discharged men, or

men who pass for such though actually deserters, must explain their early return and they do so at the navy's expense reviling and misrepresenting the service. They thus become foci of misunderstanding and hostility among people not too inclined to military obligations and often harboring a deep though latent hostility to the service for its supposedly harsh administration. The young officer fêted and petted in strata of society from which we get no enlisted men (in times of peace) is apt to underestimate the importance of this spirit and attitude of the public. For purposes of recruiting we want the sympathy and esteem of the great middle class of the population. It is not by balls and parades that the navy is popularized but by the presence and testimony in countless communities of men who go home with an honorable discharge at the end of a completed enlistment, conscious of what the navy has done for them and eager to tell of it. The recruiting officer then should consider his service successful only in so far as he gets men who will stick and defectives do not stick. They fall by the wayside.

Be on good terms with your doctor. Do not let the young examiner feel that he incurs your displeasure every time he rejects a man but encourage him to maintain a high though just and reasonable standard. Make him feel that you will share the responsibility of accepting a man who impresses all observers with promise of real value to the service in spite of being a fraction of an inch or a pound below or above the set rules and on the other hand encourage him to turn away those who technically conform to requirements and yet through a variety of petty defects give good ground for the belief that there is a radical lack or a serious latent weakness concealed somewhere. Doctors are human like other people. If a battle ensues between recruiting officer and examining surgeon over every rejection the young examiner is liable to grow timid and pass anything, while the older man will get his back up and staunchly stick to the letter of the law. Harmony comes of frankness and mutual esteem and of a common purpose to think only of the *ultimate* good of the service as a *whole*. The medical requirements are based, like so many wise navy regulations, on wide experience of service conditions and requirements and of the underlying factors of health and resistance to disease and are not designed to secure men who simply conform to an arbitrary standard of physical proportions.

8793

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Medical officers are sometimes indifferent to their responsibilities or ignorant and inexperienced but on the other hand fairness compels the admission that indirect pressure is sometimes brought to bear on the medical examiner to squeeze men through as a matter of good nature or through a false conception of what makes for the reputation of the recruiting station and the recruiting officer.

Assuming that recruiting officer and examiner have used their utmost endeavor to determine the mental, moral and physical fitness of a candidate there remains one important measure for the prevention of desertion. It should be resorted to in advance of swearing him in. In a few well-chosen words the recruiting officer should explain the character of the obligations involved in the oath about to be administered and the lasting and terrible consequences of desertion. To the qualified candidate the swearing in is a solemn moment; the whole ordeal of examination with its novelty and formality has made an impression; he is flooded with new ideas and feelings. He will perhaps never again come into the hands of an officer while in such an impressionable state.

What an opportunity such an occasion offers for driving home one or two vital truths. The prospective recruit may be too upset to grasp the full significance of the obligations he is assuming but he probably does get the idea that he must not be a coward, go over to the enemy or run away from danger. Not one in a thousand perhaps fully realizes at the moment that once sworn in nothing but perjury and the sacrifice of his citizenship can get him out of the service simply because he may wish to leave. This is the time to picture desertion in its true light so that the candidate may appreciate from his first moment of service how radical and complete is the surrender of his personal rights. Say to him, for example: "Before you take the oath of allegiance to the United States, I warn you that once you have made that pledge you are a part of the navy and to leave it except by discharge in a legal manner is desertion. In time of war desertion is punishable by death. In time of peace you cannot be shot for deserting but you become an outcast in society, you cease to be a citizen of your country, you lose all right to be employed in any capacity by the government—letter carrier, postmaster, clerk, congressman, judge, whatever the future might bring. You cannot have the trust and confidence of your friends—they will turn from you as if you

were a leper and you become a cause of shame and disgrace to yourself, your family and your home community. In civil life if you do not like your job you can chuck it, walk off, go on strike. If you enter the military service and are not content you have to stay unless through sickness or because you are unsuitable the government decides it does not want *you*. There is no running away. To do that is to brand yourself as a criminal, to earn a penitentiary sentence at the hands of a court-martial. You might escape detection for a month or a year or many years but sooner or later the fact that you deserted from the navy will leak out and until that happens you will be made miserable by your guilty secret.

"If you have an enemy he learns about it and gives you away just as you are planning to marry or get a good job. If you succeed in life and run for public office your rival discovers it and brings it up against you and you slink off in disgrace.

"I have done my duty in explaining this to you in advance. If you have not the courage to stick it out through thick and thin go now."

(Here the recruiting officer pauses and gives the weakling a *bona fide* chance to depart. He may even say to his yeoman: "Open the door.")

"Before you take this oath you must understand that there is no getting out. Have you made up your mind? Very well."

If any depart he need not be chagrined. He has done the government a real service. Some of them will eventually enlist. Those who do not are a good riddance.

It is incredible that the government should not exact some such procedure as this, but still more incredible that a recruiting officer in this day and generation can assume the responsibility of enlisting men without having made clear to the raw youth, the simple countryman or the heedless lad of the city, the seriousness of the step he is taking.

The time of all times to make the candidate realize the gravity of desertion is before he is sworn in. Everything you say and do *before* that step he recognizes as a loyal, friendly counsel. It is advice from man to man. Once sworn in he hears you as an officer to a subordinate. Your warning is then in the nature of a threat. It is a routine military duty on your part and he soon receives admonition with a totally different mental attitude.

Leaving out of account for a moment the moral damage done to his shipmates and the discredit brought upon the service by every desertion, consider a single desertion in terms of cash to the government.

The cost of a single trained recruit equals the salaries of officers and men at training station plus cost of upkeep of entire station for given period of training, all divided by output of recruits for said period.

The cost of a single enlistment equals the salaries of officers and men at recruiting office plus rent of building, publicity expenses for given period divided by number of recruits obtained for that period plus transportation and subsistence until recruit begins training.

The cost of desertion equals the cost of enlistment, plus cost of training, plus cost of trial and punishment (*i. e.*, salaries of members of court, sentry, master at arms, clerical force, salaries of all reviewing authorities during the time devoted to the case, plus expenses of upkeep of penal institution to which the deserter is committed divided by number of inmates).

Compare all this with the cost involved in a two-minute talk to a group of candidates before they are sworn in, after say 20 minutes devoted to investigating the merits of each individual applicant.

The ideal recruiting officer is not he whose monthly and quarterly reports show the greatest number of men sworn in but rather he who has personally and painstakingly studied every candidate for at least a few moments and who would consider himself to be but an automaton and seriously neglectful of the full discharge of his duties if he merely swore in the men who have been passed by the doctor and arranged for their transportation to camp or training station.

A procession of human beings files through the recruiting office. They are not mere "cannon fodder" but plastic material for the navy to make into better citizens through its school of discipline and experience. The recruiting office is like the entrance examination at college. Those who are not certainly capable of profiting by the opportunity offered are not wanted and the recruiting officer should not pass a candidate about whom he has not attempted to make a thoughtful forecast based on the medical report and his own rapid summing up of the applicant before him.

Even if there were no obligation in the matter what a field this duty affords for a study of human physiognomy and human charac-

ter. The systematic study of recruits, the daily habit of trying by scrutiny, judicious inquiries and a verbal probing of their minds and hearts will develop enormously your capacity to read and estimate and handle men throughout your career and will save your recruiting office from becoming the resort of the bum, the vagrant, the embryonic or fully developed crook and the defective just as the medical examination protects it from men on crutches or those wearing glass eyes.

THE MEDICAL OFFICER AND DESERTION

The medical officer should fully realize his comprehensive responsibility for the health and comfort of the men. Merely to deploy skill in the treatment of acute cases of illness is not to discharge one's full duty. He has a larger province than this and better medical attention does not mean devoting more care to his patients but a full consideration and proper handling of many border-line cases; the detection of the feeble in mind or body; discriminating separation of the sick from the well; the impartial investigation of suspected malingerers and reporting them with full proof to the proper authority; the request for survey and discharge of men who daily demonstrate in minor details of behavior their incapacity to adapt themselves to military life. Again, men who from some abnormality of temperament, development or physical condition are unable to discharge the duties of their ratings in a satisfactory manner should be considered with a view to discharge from the service because punishment is sooner or later meted out to them for failure and, even if the failure was only due in part to a disability they cannot help, there results a sense of having been unjustly treated which constantly leads to desertion.

It is important to see that men have the capacity of mind and body necessary for the duties of their rating. There is a special type of physique for the coal passer; there is a standard of capacity and endurance for the trying duties of the engine room. Without going outside of his legitimate province, without being a busybody, without meddlesome interference but with patience, tact and judgment the medical officer can do much to help bring about a proper adjustment of man to job, and adjustment of this kind is indispensable for harmonious production.

The conscientious and capable medical officer must at an early stage of his career get away from the idea that his function is only

to treat the sick. It is his duty to concern himself with everything that bears upon the health and comfort of the personnel—food, clothing, ventilation, the relief of deadening ennui, the elimination of anything that may indirectly lower resistance and tone. When he sees an individual whose shoes are too small for comfort or worn out; a man whose clothing does not give him adequate protection; one whose personal habits are prejudicial to himself or others; whose sleeping quarters are damp; who works by insufficient illumination, he should make the circumstances the subject of representations to proper authority.

It is not enough, however, to make verbal or written recommendations and if they receive little or no attention to feel that the blame has been lifted from his shoulders. The zeal, the intelligence, the industry, the reliability of the man who makes a recommendation has a great deal to do with the action it obtains. Some men can get things done and others cannot. The medical officer who constantly fails to receive the needed cooperation and backing should not shrug his shoulders and drop the matter accusing his superiors of indifference and neglect but should subject his own conduct to very close scrutiny. Has he been indifferent, careless, neglectful, perfunctory in the past and have his representations received only such consideration as his reputation deserved? The medical officer who talks little and does much; who is occupied heart and soul with the welfare of the men; who triumphs over the temptation to spare himself trouble and who with genuine interest combines respectful demeanor with tact and perseverance will accomplish much.

The medical officer's ability to mingle informally with the men; his intimate contact with them at the bedside; the numerous examinations he is called on to make; the frequent occasions when he attends their families all give him opportunities for getting the viewpoint and sentiment of the crew individually and collectively. To know and understand them is to be able to help them and to become also a valuable adjunct to the authorities in maintaining discipline and morale and in preventing desertion. His influence is indirect but not the less powerful for that. The judicious advice, the sympathy, the encouragement that a doctor can impart by a friendly smile or a word in season can be an enormous help to good government on board ship if he is alive to his opportunities and anxious to live up to them.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

INDIRECT FIRE FOR NAVAL GUNS

By COMMANDER WALTER S. ANDERSON, U. S. Navy

The term "indirect fire," as used here, means the firing of guns without the target being visible to anyone at the guns or on board the firing ship.

Army artillerists are, of course, very familiar with indirect fire, the principles of which are not new. In fact, gunners on shore probably make use of indirect fire more than they do of direct fire. However, in the navy we have but little if anything to do with indirect fire, and at first glance it might appear that we have no use for it at all. There are occasions, however, when the principles of indirect fire could be very usefully applied to naval guns.

Some gunnery officers may reply that we are now using indirect fire when we use the director firing system for the elevation of guns and the "follow the pointer system" for training them, because it is possible to fire our guns in this manner without the gun-pointer seeing the target. It is true this is in a sense indirect fire, but it requires for its accomplishment at least one observer on the ship who does see the target and it is, therefore, not indirect fire in the sense of the term which is employed in this article.

As I have never seen any reference to the possible use of indirect fire for guns on board ship in any of our standard books or articles on gunnery, nor even heard it discussed, it seemed that these notes might prove useful.

In 1914 I was executive officer of the *Des Moines*, lying at that time in the Panuco River at Tampico, Mexico. At this time occurred the so-called "Tampico Incident." Mexicans had arrested and removed from their ship's boat, an officer and a boat's crew from the U. S. S. *Dolphin*. Certain demands had been made, and the entire situation was one which indicated a strong proba-

bility of active operations. That this was correct was proved soon afterwards by the taking of Vera Cruz.

Plans were of course made for protecting American lives and property at Tampico, the measures including taking the city of Tampico for that purpose if necessary. It was very probable that in that event it would be useful to be able to direct heavy gun fire into the out-skirts of Tampico. As the city of Tampico intervened and cut off the ship's view from most of the country to the north and west of the city, it at first seemed that our naval guns mounted on board ship would be useless for this purpose.

However, it occurred to me that we could make use of the principles of "indirect fire," and we prepared to do so if necessary. Our scheme was a simple one. It was easy of application under the conditions there found, because the ship lay for hours on a steady heading, without rolling. It could, however, be applied even though there was some slight motion to the ship.

It was proposed to mark off a chart in squares giving a definite designation to each square.

An observer, that is, a spotter, together with signalmen, was to be stationed in a definite elevated position giving a commanding view of the surrounding country and in plain view of the ship. He was to have a chart marked in squares and a similar chart was to be on board ship. All our guns had the usual brass training circles showing their train in degrees from the bow as a reference point. When a signal was received from the observing station indicating the location to be put under fire the navigator was to ascertain its bearing from the ship's head which would give us the point of train or target bearing. It is conceded that this is crude, but later on it will be indicated how greater accuracy was to be obtained. The navigator was also to give the distance in yards from the ship's position to the location to be brought under fire, which would give us the range. For any given position of the ship a table of ranges could, of course, be made up in advance for the centers of the various squares.

Assume that we now have the guns trained toward the designated location, which we will call the target, and that we know the range. The usual ballistic calculations are made to obtain the ballistic correction to be applied to the actual range, and to obtain the original deflection. Remember that the sights have not been

moved yet; they read zero in range and 50 in deflection, that is, they are at the median point in deflection.

In army firing on shore with the guns trained as desired, the elevation for indirect firing would be obtained by the use of the gunner's quadrant, or a sight based upon the principle of a gunner's quadrant. In the case of our smaller ships, however, we assume that there are no gunner's quadrants available on board. There are, of course, carpenter's levels which can be used.

Let us take the simplest case first. The gun is properly trained. Level the gun. This can be done with the aid of a carpenter's level, or for practical purposes it could probably be done accurately enough without the aid of the level as will be seen later. We now want a point of aim as a reference point. With the sights set range zero, deflection 50, look through the sights. If the cross-wires are by chance on an object on shore in a position readily identified which can be returned to after the sight is moved, we are in luck, and have the simplest proposition of all. This seems like a far-fetched supposition, but when a gunboat or a small cruiser is in a river with trees or buildings on the bank, it is not at all an improbable assumption as actual trial at Tampico showed.

Assumed then that the sight is on a definite point of aim. Now move the sights until its range reading is the initial sight bar range, viz., actual range corrected by ballistic correction. Also put the initial deflection on the deflection scale. These corrections have, of course, depressed the telescopic sight and moved it laterally. Now elevate the gun and train as necessary in order to bring the cross wires of the sight back on the point of aim. The gun is now properly laid to fire at the designated target.

Suppose no carpenter's level is available for leveling the gun, and we desire to level it as nearly as practicable. With the gun trained as already mentioned and approximately level, look through the sight and slightly elevate or depress the gun until the cross-wires are brought on a point of aim on shore which is judged to be at the same height as the transverse axis of the sight. It is conceded that this is to be done by the "seaman's eye," and is liable to some error. The probable error has not as much effect as one might suppose, however, as a vertical error of one foot at a distance of 600 yards would introduce an error of less than two minutes of arc in the elevation of the gun. At 4000 yards this would introduce a range error of 50 yards, or less.

Suppose in looking through the sight for a point of aim there is no definite point sufficiently conspicuous to serve. One solution is to send men on shore with a marker pole or flag. The marker carried by these men would then constitute a point of aim and could be moved to the desired position by these men obeying signalled orders from the ship.

To the possible objection that these men are standing in almost the direction of fire the answer would appear to be that if thousands of men in Europe had no objection to standing in the direct line of fire with a barrage going over their heads, there is no reason why naval men could not do likewise. The guns being elevated, the shell would pass far above their heads. In this connection it should be noted that the fire control officer, should, by an inspection of the range table, which shows the maximum ordinate of the trajectory, assure himself that the shell will pass clear above any intervening hills, buildings or other obstructions. There is slight possibility of intervening hills or buildings obstructing the fire if the range is at all great.

Suppose in looking for an original point of aim none is found and it is impracticable to send men on shore with a marker. The case now is just as simple in principle, but a little more difficult in its application. Assume the gun trained toward the target, gun level, sight set with range zero, deflection 50. Do not move the gun, but move the sight as necessary, and no more than necessary, to bring it upon a chosen, definite point of aim. Make a note of the range and deflection reading. These are the corrections which must be applied to the ordinarily proper range and deflection reading when the gun is actually laid for firing. Let us call these "point of aim corrections." If the point of aim correction in range is but slight, for practical purposes it could be simply applied in yards as an additive or a subtractive correction to the proper initial sight bar range.

Theoretically there is a slight error in this, but if the correction is small the slight error is negligible. If the point of aim range correction is considerable, which is improbable, to obtain the proper sight bar reading in range for laying the gun is a bit more complicated. Procedure is as follows:

Enter the range table with the proper sight bar range as a range, and pick out the angle of departure corresponding to it. Also with the point of aim correction as a range, pick out the

angle of departure corresponding to it. Combine these two angles of departure. With their algebraic sum as an angle of departure, enter the range table and pick out the range. This becomes a sight bar range reading for laying the gun. Set the sight bar to this reading. Correct the proper initial deflection by the deflection point of aim correction, thus giving the deflection for laying the gun. Put this deflection on the sight. Now move the gun until the cross-wires are brought on the point of aim. The gun is now properly laid to fire at the designated target.

So far we have winked at the fact that even if everything were perfect, there would be a lateral dispersion at the target equal to the lateral difference in the guns' positions. For such operations this is probably not undesirable. In the army they actually put certain varying deflection corrections on the various guns of a battery to give them a certain amount of lateral spread.

If it is desired to reduce the lateral spread, it is easy to figure out and apply for any range the deflection corrections which will converge the guns or will diverge them to any desired amount. One unit on the deflection scale, a mil, will cause a lateral alteration in the fall of the shot equal to $1/1000$ of the range. In this same way, should it be necessary for any reason to converge the sights of all guns of a battery upon one point of aim, there must be individual deflection corrections for each gun, in order to make them fire parallel or to converge at the target, or to give a certain spread.

In any dealing with deflection in this way where deflection of the guns is to differ, one gun must be taken as a reference or a "master gun." Tables previously prepared can then show what deflection correction for each of the other guns is to be applied to produce certain convergence or certain spread.

As conceded originally the guns were laid for train very crudely, with the possibility of a quarter of a degree or more of error, with the facilities then available on board the *Des Moines*. Of course, vessels equipped with a director installation for their small guns can apply the principles outlined in this article by simpler methods. However, we will still consider a vessel of the *Des Moines*' gunnery equipment. Due to the crudeness in laying the guns for train, there is a probability that the lateral dispersion might be excessive and difficult of elimination, if several guns commenced fire at once. It would probably be desirable to open

fire with the master gun alone. Corrections to range and deflection should then be made consistent with the reports of the spotter and the guns laid according to these corrections. Fire could then be opened by additional guns one at a time, correcting the lateral dispersion by deflection corrections as necessary to converge the first two guns, before the third is permitted to fire. The third gun could then open fire, convergence corrections would then be made, and other guns would open fire successively in the same way.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVIGATION NOTES

By COMMANDER J. F. GREEN, U. S. Navy

No new principles in navigation are contained in these notes. There are indeed few things in navigation that are new. But the matter discussed herein has not, to the writer's knowledge, been presented in just the manner in which it is given here, and it is hoped that this discussion will be of practical value to beginning navigators at least. As the subjects treated are unrelated, they are presented under separate headings.

I. Star identification by forecasting their positions in the heavens.

It is perhaps safe to say that the officer inexperienced in navigation is somewhat inclined to pass up the use of stars for navigational purposes because he feels that they involve more complications than sights of the sun. This is not the case. If a good horizon can be obtained, as it usually can after sunset and about daybreak, starsights can be taken easily and accurately and good fixes obtained by crossing their Sumner lines. A good navigator, especially on a speedy ship should always obtain star fixes both night and morning. Planets involve no more difficulties than do fixed stars.

Probably the greatest difficulty that the beginning navigator struggles with is his lack of knowledge what stars to take, or his inability to find out what star he has taken a sight of. He has seen various treatises on star identification, but probably most of them looked so complicated that he didn't think he could get anything out of them. Indeed most of them are complicated. Of course there is the Star Identification Table which is an excellent book

when one is familiar with its use. But even so it takes time to dig a star out of it.

There is a method though, a simple method, by which a navigator can forecast the position of stars, by bearing and altitude, at any instant. He can select such stars as will give a good cut with their lines, he can know just where to look for them, and, having taken sights, can work them out at once with certainty as to their identity, though he may know nothing about their constellations.

The problem given below to illustrate this is a practical one such as a navigator on a cruising ship would encounter. The problem is to forecast available stars at sunrise on a moving ship. The principle is the same however for forecasting available stars at sunset.

Problem.—May 10, 1920, a navigator has fixed his position at 8 p. m. by watch, as Lat. $34^{\circ} 59' 40''$ N., Long. $72^{\circ} 49' 30''$ W. The captain sets course for the night as 330° true, speed 12 knots, but wishes to change course at 6 a. m. next morning.

At 8 p. m. the C—W is $4^h 50^m 01^s$. Chronom. fast on G. M. T. $0^h 02^m 00^s$.

The navigator wishes to get a star fix before 6 a. m. next morning. He decides to take sights one-half hour before sunrise. He leaves a call for 45 minutes before sunrise. What time will this be by watch?

What planets and stars (of magnitudes under plus 1.5) will be visible? Which of these will make a good cut and what will be their true bearings and altitudes?

Solution.—First find the L. M. T. corresponding to 8 p. m. by watch:

	h	m	s
W. T.	8	00	00
C—W	4	50	01
C. F.	12	50	01
C. C.	0	02	00
G. M. T.	12	48	01 (10)
Long. W	4	51	18
L. M. T.	7	56	43

Now using the latitude at 8 p. m. which we will call Lat_1 , find the time of sunrise for that latitude and get the hour-angle to sunrise for that latitude.

L. M. T. of sunrise Lat_1	^h 17	^m 00	^s 00 (from N. A., Table VI)
L. M. T. at 8 p. m.	7	56	43
H. A. to S. R. for Lat_1	9	03	17
$= 9.06$ hours			

The approximate run to S. R. will be $9.06 \times 12 = 108.7$ miles.

The approximate position at S. R. will be

	True course	Dist.	N.	W.
	330°	108.7	94.1	54.4
Lat_1	$34^\circ 59' 40''$ N.		Mid. Lat. 35.8° .	
l	1 34 06 N.		Change in longitude per hour at 12	
Lat_2	36 33 46 N.		knots speed $= 7.4'$.	

It is not necessary to find the longitude in this step.

Now use Lat_2 to find a nearer H. A. to S. R.

L. M. T. of S. R. for Lat_2	^h 16	^m 56.5 (from N. A.)
L. M. T. at 8 p. m.	7	56.7
H. A. to S. R.	8	59.8
$= 539.8$ minutes		

Hence,

$$\text{Interval to S. R.} = \frac{539.8 \times 15}{900 - 7.4} = \frac{8097}{892.6} \begin{array}{l} \log 3.90832 \\ \log 2.95066 \end{array}$$

$$\text{Interval to S. R.} \quad 9.071 \text{ hours} \quad \log 0.95766$$

In this problem it is assumed that there is no current.

Run to S. R. $9.071 \times 12 = 108.9$ miles.

	T. C.	Dist.	N.	W.	D.
	330	108.9	94.3	54.5	67.2
Lat_1	34	59	40 N.	Long.	72 49 30 W.
l	1	34	18 N.	D	1 07 12 W.
Lat_3	36	33	58 N.	Long. ₃	73 56 42 W.
L_0	35.8°				

This position will be very close to the exact position at S. R. and may be assumed as such. Now for results.

	h	m	s
L. M. T. of S. R. (Position 3)	16	56	30
Long. 3	4	55	46.8
G. M. T. of S. R.	21	52	16.8(10)
C. C. (sign reversed)	0	02	00
C. F.	9	54	16.8
C—W	4	50	01
W. T. of S. R.	5	04	15.8
Less one-half hour	0	30	00
W. T. to take sights	4	34	15.8
Less 15 minutes	0	15	00
W. T. to call navigator	4	19	15.8

Now to find the available stars. We know that the L. S. T. at any time and place is the R. A. of the meridian at that time and place. Therefore, find the L. S. T. for the L. M. T. at which we are going to take the sights.

	h	m	s		h	m	s
L. M. T. of S. R.	16	56	30	G. M. T. of S. R.	21	52	16.8(10)
Less $\frac{1}{2}$ hour	00	30	00		00	30	00
L. M. T. of sight	16	26	30	G. M. T. of sight	21	22	16.8(10)
R. A. M. \odot	3	11	55.6				
Cor. Table III		3	30.6				
L. S. T. of sight	19	41	56.2				

Now look up the stars of first magnitude and also the planets and see which ones have right ascensions equal to the L. S. T. given above or within four or five hours on either side of it. If the R. A. of any star or planet is equal to the L. S. T. at time of sight that star will of course be on the meridian. Stars whose R. A.'s are greater or less than this L. S. T. will be to the east or west of the meridian. To make a good cut stars should be chosen which are in adjacent quadrants. The declinations given in the N. A. will help in choosing satisfactory stars. By plotting the stars on the plane of the Equinoctial or by determining whether their

H. A.'s are minus or plus will show whether the stars bear east or west of the meridian.

By comparing the L. S. T. at sight with the R. A.'s of the planets we find that no planets are available. Mars is just about setting.

But there are several bright stars available. Of these we may select Antares, Vega, Altair and Deneb, all of which are of magnitude under plus 1.5 and are within about four hours east or west of our meridian. Altair is within about four minutes of the meridian and would make a good latitude sight. It is not necessary to work out its bearing as it would bear nearly south and would be unmistakable. Antares has high southerly declination and is probably of low altitude. Vega and Deneb probably make a good cut as Vega is west of the meridian and has north declination while Deneb is east of the meridian with north declination. That is, they are in adjacent quadrants. Now let us find their bearings.

	h	m	s		h	m	s
L. S. T. of sight	19	41	56.2		19	41	56.2
R. A. Vega	18	34	16.2	R. A. Deneb	20	38	44.2
H. A. Vega	+ 1	07	40	H. A. Deneb	(-) 0	56	48
Dec. Vega	+ 38°	42.4'		Dec. Deneb	+ 44°	59.5'	
Lat.	36°	33'	58" N.	Lat.	36°	33'	58" N.
Bearing Vega	284°	02'		Bearing Deneb	47°	28'	

The bearing of a navigational star would ordinarily be sufficient identification, but, if more certain identification is desired, take the H. A., Lat. and Dec. as given above and solve for the altitude in each case by the Mark St. Hilaire cosin-haversin method. In this case we find altitude of Vega $76^{\circ} 27' 15''$ altitude of Deneb $76^{\circ} 22' 15''$, and the stars can be identified without any doubt.

Discussion.—It may be objected that this method is a long one, but such is not the case. As treated here it is somewhat lengthy, but this is because considerable accuracy has been sought.

In this case the ship ran on a course within 30° of north, at 12 knots' speed which is a fair speed for cruising at night. It will be seen, however, that the resulting run for S. R. Lat.₁ differed only 0.2 mile from that of S. R. for Lat.₃. Therefore, unless the ship runs about north or south at a very high speed, the

process of finding the position at sunrise or sunset, and hence the L. M. T. of sunrise or sunset, can be much shortened. The run can be stepped off on a chart, the position at S. R. found from chart and L. M. T. of S. R. taken from N. A. for that latitude. Convert this to L. S. T. Find the star's H. A. and Dec. and using Weir's diagram its bearing is found at once. Not more than 20 minutes are necessary to locate all good stars available and it is a great satisfaction to a navigator to put them in his pocket and be able to identify a star at once and know that it is good without having to go through the star identification table after the sight is taken. As before stated this method is equally applicable to stars taken at sunset. In this case the bright stars come out before their constellations do and this is the best time for taking them while the horizon is good.

II. *Use of interval to noon method when course is changed between morning sight and noon.*

Pages 676-684 of the 1918 edition of Muir's Navigation describe the interval to noon method of navigation and its use in solving a day's work. It is a very pretty method and a good one, *provided no change of course or speed is made between the time of morning sight and L. A. N.* If a change of either is made, the denominator factor in the interval to noon equation, which represents the change of longitude per hour due to speed, becomes indeterminable. Now as every one knows, naval vessels frequently maneuver all the forenoon and a navigational method which does not allow of a change of course is not a good method.

The following problem and solution is given to show that the interval to noon method can be used though the ship may maneuver at varying courses and speeds:

May 14, 1920, civil date, a navigator has fixed his position, by star sights, at 6 a. m., by watch, at Lat. $37^{\circ} 17' 00''$ N., Long. $72^{\circ} 27' 00''$ W. Ship then runs on course 150° true at 12 knots' speed until 7.30 a. m. by watch, of same day, when the navigator gets a sight of sun's lower limb which he works by St. Hilaire method with results as follows: Altitude difference $01.0'$ toward; bearing of \odot true 95° ; W. T. $7^h 30^m 00^s$; C—W $4^h 48^m 00^s$; Chronom. fast on G. M. T. $0^h 07^m 50.9^s$.

Ship then maneuvers as follows until 11 a. m. by watch:

T. C.	Time on course. Minutes	Speed. Knots
90	20	12
45	68	10
270	92	12
225	30	10

At 11 a. m. by watch course is set at 150° true, speed 12 knots until L. A. N. At L. A. N. the sun's lower limb is observed $71^\circ 38' 00''$. I. C. (—) $1' 00''$. Height of eye 30 feet.

Find D. R. position at 7.30 a. m. by watch.

Navigator's position at 7.30 a. m. by watch and current per hour in longitude.

Error of watch on L. A. T. at 7.30 a. m. by watch.

Navigator's position at 11 a. m. by watch.

Error of watch on L. A. T. at 11 a. m. by watch.

Interval to noon from 11 a. m. by watch.

Navigator's position at L. A. N.

Constant for L. A. N.

True noon latitude.

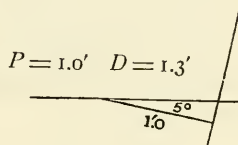
True noon longitude.

NOTE:—By navigator's position is meant the most accurate position obtainable with the data, but which is not a fix.

Solution.—

Run from 6 a. m. to 7.30 a. m. (by watch)

Course	Dist.	<i>l</i>	<i>p</i>	<i>D</i>	<i>L</i> ₀
150°	18	15.6	9	11.3	37.2°
Lat. left	$37^\circ 17' 00''$	N.			
<i>l</i>	15 36	S.			
Lat. in	37 01 24	N.			



Long. left	$72^\circ 27' 00''$	W.	
<i>D</i>	11 18	E.	
7.30 a. m. Long. in	72 15 42	W.	
Current in Long. for 1.5 hours	1 18	E.	
Nav. Pos. at	72 14 24	W.	
7.30 a. m. by watch	37 01 24	N.	

$$\text{Current in Long. per hour} = \frac{1.3}{1.5} = .87'E. \quad F = .11'.$$

Watch Error

W. T.	7	30	00	
C—W	4	48	00	
C. F.	12	18	00	
C. C.	(-)	0	07	50.9
G. M. T.	0	10	09.1	(14)
Eqt. plus		3	48.5	
G. A. T.	0	13	57.6	
Long. Cor.	4	48	57.6	
L. A. T.	19	25	00	
W. T.	19	30	00	
Watch error	0	5	00	Fast on
L. A. T. at 7.30 a. m. by watch.				

Run to 11 a. m. by Watch

True course	Dist.	N.	S.	E.	W.	
90°	4.0			4.0		$L_0 37^\circ$
45	11.3	8.0		8.0		$D=12.4$ W.
270	18.4				18.4	
225	5.0		3.5		3.5	
		4.5 N.			9.9 W.	

Lat. at 7.30 (W. T.)	37° 01' 24" N.	Long. 72° 14' 24" W.
<i>l</i>	4 30 N.	<i>D</i> 12 24 W.
Lat. 11 a. m. by watch	37 05 54 N.	Long. 72 26 48 W.
=Lat. of Nav. Pos.		

Current in Long. = $3\frac{1}{2} \times .87$	3 02.7 E.
Long. 11 a. m. by watch (Nav. Pos.)	72 23 45.3 W.
Long. 7.30 by watch (Nav. Pos.)	72 14 24
Change in Long.	9 21.3 W.
	= 0 ^m 37.4 ^s

Watch error at 7.30 a. m.	0 ^h 5 ^m 00 ^s Fast
Watch error at 11.00 a. m.	0 05 37.4 Fast on L. A. T.

It is seen here that the watch was fast on L. A. T. 0^h 05^m.00^s at 7.30 a. m. by watch. From 7.30 a. m. to 11 a. m. (W. T.) the watch has been carried from one locality to another which is 9' 21.3" to the west of the first locality. As the watch has not been reset, it has, due to the change of longitude to the westward,

become faster on the new locality by the amount of the change of longitude expressed in time. If the change had been made to the eastward it would have become slower by that amount. No account is taken here of the mechanical gain or loss of the watch as in a navigating watch this should be inconsiderable for the interval of time involved.

It is now only necessary to find the L. A. T. corresponding to 11 a. m. by watch and the interval to noon method can be taken up.

It may be said that, while the even hour of 11 a. m. is used in this problem, this solution is equally applicable should the maneuvering cease at any time before or after 11 a. m. so long as the time of steadying on the last course is known.

Watch error	0	05	37.4	Fast at 11 a. m.
W. T.	23	00	00	(Expressed astronomically)
L. A. T.	22	54	22.6	
H. A.	(-)	1	05	37.4 = Arc 16° 24' 21"

Run in Longitude for One Hour

Course	Dist.	<i>l.</i>	<i>p.</i>	<i>D.</i>	<i>L₀</i>
150°	12	10.4	6.0	7.5	37°

$$\text{Interval to noon } \frac{984.35}{900 - 7.5 - .87} = 1.104$$

$$= 1^{\text{h}} 06^{\text{m}} 14.4^{\text{s}}$$

$$\text{W. T. } \frac{11 \quad 00 \quad 00}{\quad}$$

$$\text{W. T. of L. A. N. } \frac{12 \quad 06 \quad 14.4}{\quad}$$

Run from 11 a. m. (by Watch) to L. A. N.

Course	Dist.	<i>l.</i>	<i>p.</i>	<i>D.</i>
150°	13.2	11.4	6.6	8.3

$$\text{Lat. (Nav. Pos.) 11 a. m. } \quad 37^{\circ} 05' 54'' \text{ N.}$$

$$l \quad \quad \quad 11 \quad 24 \quad \text{S.}$$

$$\text{Lat. (Nav. Pos.) L. A. N. } \quad 36 \quad 54 \quad 30 \quad \text{N.}$$

$$L_0 37^{\circ}$$

$$\text{Long. (Nav. Pos.) 11 a. m. } \quad 72^{\circ} 23' 45'' \text{ W.}$$

$$D \quad \quad \quad 08 \quad 18 \quad \text{E.}$$

$$72 \quad 15 \quad 27 \quad \text{W.}$$

$$\text{Current in Long.} = 1.104 \times .87 \quad 57.6 \text{ E.}$$

$$\text{Long. (Nav. Pos.) L. A. N. } \quad 72 \quad 14 \quad 29.4 \text{ W.}$$

Noon Constant—True Lat. and Long. at L. A. N.

			I. C. (-)	0° 01' 00"
L. A. T. of L. A. N	^h 0 ^m 0 ^s 0		T. 46+	10 22
Long. (Nav. Pos.) L. A. N.	4 48 58		Sub C (-)	08
G. A. T. of L. A. N.	4 48 58 (14)		C	00 09 14
Eqt.	(-) 3 48.5		90+d	108 40 09
G. M. T. of L. A. N.	4 45 09.5		K	108 30 55
☉ Dec. +	18 40 09	<i>h</i> Obs.		71 38 00
	90	Lat. true		36 52 55 N.
90+d	108 40 09	Lat. (Nav. Pos.)		36 54 30 N.
App. Lat.	36 54 30	Δ Lat.		1 35 S.
App. Alt.	71 45 39			

Long. (Nav. Pos.)	72° 14' 29.4" W.
Δ Long. for Δ Lat.	10.4 W.
Long. true	72° 14' 39.8" W.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PSYCHOLOGY AND THE NAVY

By LIEUTENANT F. H. GILMER, U. S. Navy

For years the navy has recognized leadership and the handling of men as the paramount subject of a naval officer's consideration and yet they have failed to realize that these subjects are but sub-topics of the science of psychology. Psychology is a science in spite of the misconception of many people that connect it with Ouija boards, spiritualists and mind-reading. The science of psychology has found its place in the curriculum of the leading universities of the country. The navy, which generally leads the country in the development of new sciences, is lagging behind in this field. Psychology has entered the industrial world and by finding the right job for a man has greatly increased the efficiency of the man. It has entered the educational world and by examinations it has determined what limits are put on a man's ability by his mental make-up. In conjunction with the criminal world psychology is doing much to abolish the old dungeon form of penitentiary and bring in the reformatory.

The relations existing between psychology and the navy naturally divide themselves into two parts: First, those concerning the good that the service would derive from psychology, and second, those concerning the methods of introducing psychology into the navy.

If psychology were introduced in the recruiting service of the navy, it would greatly decrease the number of desertions by weeding out the men whose mental make-up was such as to cause them to desert; it would also prevent the enlistment of men that were mentally unfitted—a thing which rarely happens, but a thing which should never happen. If psychology were used after a man had enlisted in the service, it would then determine the job for

which he was best fitted. This would increase his efficiency and his satisfaction. An increase in the efficiency of a single man means an increase in the efficiency of the service as a whole. The satisfaction of a single man is of vast importance; for the old adage, "A single bad apple will spoil a barrel of apples," still holds true.

Psychology could be used in the selection of candidates for the naval academy as it has been used in the selection of students for several of the leading universities of the country. In this same manner it would greatly decrease the percentage of men that enter the Naval Academy and failed to graduate. By continued use of psychology throughout the four years at the Naval Academy the men that might graduate from the Academy and yet who were doomed to failure in the service would be weeded out. The Academy would no longer make poor officers out of fine farmers, as it often does when placing its entire dependence upon mental entrance examinations.

Perhaps the most important and far-reaching effect of psychology would be the development of the ability of the officer personnel in the arts of "handling men" and "leadership." When the service desires an officer to become an expert in the handling of a piece of machinery, they take great pains to teach him the manner in which that machinery is made, the manner in which it functions and the manner of controlling these functions. The human mind is the greatest machine in the world. Psychology is the science of the human mind; by it we learn the construction of the mind, the manner in which the mind works and the way in which to direct that mind so as to derive the most efficiency. The service should instruct an officer in this science; it should equip him so that he can at least handle men with the same skill that he handles machines.

There are three methods of introducing psychology into the service: First, by the employment of civilian experts in the Navy Department at Washington. These civilians could construct charts and prepare the necessary psychological examinations for the various fields in the service. Secondly, psychology could be introduced in the curriculum of the Naval Academy, the post-graduate course, and possibly the war college. The third, and by far the best method, would be to select several young officers—

send them to one of the leading universities of the country—preferably the University of Pennsylvania or Columbia—and there let them pursue the study of psychology. These men could afterwards be used in the same manner in which civilian psychologists were used in the first two methods and their previous naval training would give them a decided advantage over the civilian psychologists.

In concluding it is only necessary to state that psychology will play an important rôle in many branches of the naval service and that it is expedient that it be introduced into the naval service as soon as possible.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CONSTITUTION AND BY-LAWS ¹

ARTICLE I.—TITLE

This organization shall be called the United States Naval Institute.

ARTICLE II.—OBJECT

Its object is the advancement of professional, literary, and scientific knowledge in the navy.

ARTICLE III.—HEADQUARTERS

The headquarters of the Institute shall be at the United States Naval Academy, Annapolis, Md., or in such other place as the Board of Control may select.

ARTICLE IV.—OFFICERS

The officers shall be as follows:

A President.

A Vice-President.

A Board of Control.

A Secretary and Treasurer.

ARTICLE V.—ELECTION OF OFFICERS

SECTION I. There shall be a meeting of the Institute at headquarters on the second Friday in October of each year, of which at least two weeks' notice shall be given, at which meeting all the foregoing officers shall be elected by ballot in open session, and a majority of votes given by presence or proxy shall elect; regular or life members only being eligible for office.

¹ As amended at the annual meeting of the U. S. Naval Institute, October 8, 1920.

SEC. 2. Absent members who have the constitutional right to vote may vote by proxy at such elections, and in the same manner on all questions involving changes in the Constitution and By-Laws, and upon questions involving the expulsion of members and the election of honorary members. On all other questions voting must be by actual presence. Life members shall have the full right of regular members to vote on every question. Honorary and associate members shall not have the privilege of voting. Each proxy must be signed by the member whose vote is to be represented.

SEC. 3. Members elected to the position of officers of the Institute will assume their respective duties at the date from which elected.

SEC. 4. Casual vacancies in the offices of the Institute may be temporarily filled by the Board of Control.

ARTICLE VI.—DUTIES OF OFFICERS

SECTION 1. The President shall preside at meetings of the Institute and of the Board of Control at which he may be present.

SEC. 2. In the absence of the President, the Vice-President shall preside. In the absence of both President and the Vice-President the Senior member present of the Board of Control shall preside.

SEC. 3. The Board of Control shall consist of nine members, of whom the President, Vice-President and the Secretary and Treasurer shall be members, *ex officio*, the other six shall be members in good standing, regular or life. The duties of the Board of Control shall be the management of all the financial and administrative business of the Institute, including the censorship, printing, and control of its publications. The Secretary and Treasurer shall be its medium of communication and the recorder of its transactions. Regular monthly meetings of the Board of Control shall be held when called by the Secretary and Treasurer, and he shall issue a call for a special meeting at any time upon the written request of two members of the Board. A quorum shall consist of four members. It shall be the duty of this Board to appoint a committee of three of its own members to audit and certify the books and accounts of the Secretary and Treasurer once every year.

SEC. 4. The Secretary and Treasurer shall keep a register of the members in which shall be noted all changes; an authenticated copy of the Constitution and By-Laws in force; a journal of the Proceedings of the Institute; a separate journal of the transactions of the Board of Control; a receipt and expenditure book; an account-current with each member. Under the authority of the Board of Control, he shall be the disbursing and purchasing officer of the Institute and the custodian of the funds, securities, and assets, and it shall be his duty to furnish members with receipts for dues paid. He shall attend to all correspondence and keep a record thereof, give due notice of meetings of the Institute and Board of Control, have charge of the stenographer and copyists employed to prepare records of the Proceedings, and he shall distribute all publications. The books of accounts of the Institute shall always be open to inspection by any member.

ARTICLE VII.—MEMBERSHIP

SECTION 1. The Institute shall consist of regular, life, honorary, and associate members.

SEC. 2. Officers of the navy, marine corps, and all civil officers attached to the naval service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the navy subsequent to joining the Institute will be regarded as belonging to the class described in this section.

SEC. 3. The Prize Essayist of each year shall be a life member without payment of fee.

SEC. 4. Honorary members shall be selected from distinguished naval and military officers, and from eminent men of learning in civil life. The Secretary and Assistant Secretary of the Navy shall be, *ex officio*, honorary members. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

SEC. 5. Associate members shall be elected from officers of the army, revenue marine, foreign officers of the naval and mili-

tary professions, and from persons in civil life who may be interested in the purposes of the Institute.

SEC. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the navy and marine corps shall not at any time exceed one hundred (100).

SEC. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election and nominees receiving a majority of the votes of the Board membership shall be considered elected as nominated to associate or life membership in the Naval Institute.

SEC. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

SEC. 9. No member of the Institute shall be dismissed except by recommendation of the Board of Control, and by the affirmative votes of two-thirds of such members of the Institute as may vote at any regular or called meeting, of which at least two months' notice shall be given; members of the Institute must be given an opportunity to vote on a ballot mailed by the Secretary and Treasurer at least two months before the meeting in question. Without the recommendation of the Board of Control, no member can be dismissed except by a three-fourths vote taken as detailed in the foregoing sentence.

SEC. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE VIII.—RESERVE FUND

There shall be a Reserve Fund, consisting of the \$3050 originally credited to that fund, together with all life-membership fees which have been or may hereafter be received, and the principal of this fund shall be held in perpetuity to guarantee the future interest of life members. The Reserve Fund shall be invested under the direction of the Board of Control, but no part of that fund shall be invested in any other than United States bonds unless by the unanimous vote of the Board of Control given in writing at a special meeting called for the purpose.

ARTICLE IX.—MEETINGS

SECTION 1. Meetings of the Institute shall be called by the Secretary and Treasurer when directed by the Board of Control.

SEC. 2. Notice of meetings shall state the business that will be brought before the meeting.

SEC. 3. A stenographer may be employed when authorized by the Board of Control.

ARTICLE X.—PAPERS AND PROCEEDINGS

SECTION 1. There shall be published quarterly, or as much oftener as the Board of Control may decide, "PROCEEDINGS OF THE U. S. NAVAL INSTITUTE," containing such papers and discussions as are approved by the Board of Control, together with editorial and professional notes deemed of value to the service.

SEC. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

SEC. 3. Copies of the PROCEEDINGS and complete sets may be sold at a charge fixed by the Board of Control, and the Board shall also fix the price of annual subscription for others than members.

SEC. 4. A receipt and expenditure account of the Institute's publications, showing the number on hand, shall be included in the report of the Secretary and Treasurer of each year.

SEC. 5. The Board of Control shall decide the size of the edition of each number of the PROCEEDINGS to be published, and also the number of reprints.

SEC. 6. The PROCEEDINGS shall be copyrighted in behalf of the Institute by a trustee appointed by the Board of Control.

ARTICLE XI.—ANNUAL PRIZE ESSAY

SECTION 1. A prize of two hundred dollars, with a gold medal, shall be offered each year for the best essay on any subject pertaining to the naval profession.

SEC. 2. The award for the above-named prize shall be made by the Board of Control, voting by ballot; and the time and manner of submitting such essays shall be determined and announced by said board.

SEC. 3. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of a gold medal.

ARTICLE XII.—AMENDMENTS

No addition or amendment to the Constitution shall be made without the assent of two-thirds of the members voting; the By-Laws, however, may be amended by a majority vote. Notice of proposed changes or additions, together with a form of ballot on same, shall be mailed by the Secretary and Treasurer to each life and regular member at least two months before action is taken.

BY-LAWS

ARTICLE I

The rules of the United States House of Representatives shall, in so far as applicable, govern the parliamentary proceedings of the Society.

ARTICLE II

1. At both regular and stated meetings the routine of business shall be as follows:

2. At executive meetings, the President, or, in his absence, the Vice-President, or, in the absence of both, a member of the Board

of Control, shall call the meeting to order, and occupy the chair during the session; in the absence of these, the meeting shall appoint a Chairman.

3. At meetings for the presentation of papers and discussion, the Society shall be called to order as above provided, and a Chairman shall be appointed by the presiding officer, reference being had to the subject about to be discussed, and an expert in the specialty to which it relates being selected.

4. At regular meetings after the presentation of the paper of the evening, or on the termination of the arguments made by members appointed to or voluntarily appearing to enter into formal discussion, the Chairman shall make such review of the paper as he may deem proper. Informal discussion shall then be in order, each speaker being allowed not exceeding ten minutes in the aggregate, unless by special consent of the Society. The author of the paper shall, in conclusion, be allowed such time in making a résumé of the discussion as he may deem necessary. The discussion ended, the Chairman shall close the proceedings with such remarks as he may be pleased to offer.

5. At the close of the concluding remarks of the Chairman, the Society shall go into executive session, as hereinbefore provided, for the transaction of business as follows:

1. Stated business, if there shall be any to be considered.
2. Unfinished business taken up.
3. Reports of officers and committees.
4. Applications for membership reported and voted upon.
5. Correspondence read.
6. Miscellaneous business transacted.
7. New business introduced.
8. Adjournment.

U. S. NAVAL INSTITUTE PROCEEDINGS NO. 213

THE HIGH SEA FLEET AT JUTLAND

By LIEUT. COMMANDER H. H. FROST, U. S. Navy

CORRECTION

In Fig. 4 the distance between the *Lion* and the *Lutzow* should be 53 miles at 2.00 p. m. In Fig. 3 the distance between Beatty and Hipper should likewise be 53 miles. As before stated, Fig. 2 was taken from a German sketch, which it was assumed was properly drawn to scale; there is a strong possibility that the German sketch was not drawn to scale, and in this case the screen of light cruisers and destroyers around the German battle cruisers probably covered a greater area than that shown in Fig. 2. Mr. G. J. Hazard, Technical Aide at the Naval War College, very kindly brought the errors in Figs. 3 and 4 to my attention.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 5123. New members, 11. Resignations, 2. Dropped, 221.

Dues The annual dues (\$3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

Address of Members *All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.* Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 15th of each month.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

Reprints of Articles The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary

and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 145, 146, 147, Notice 149, 155, 167 and 173 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, Md., December 15, 1920.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO	I
PUBLICATIONS, U. S. NAVAL INSTITUTE	(2)
SPECIAL NOTICE	154
TOPICS FOR ESSAYS	155

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.	}	France	91
NAVAL POLICY.		Germany	' 96
MATÉRIEL.		Great Britain.....	99
PERSONNEL.		United States.....	100
MERCHANT MARINE.		Japan	107
AERONAUTICS			110
ENGINEERING			114
NAVIGATION AND RADIO.....			123
ORDNANCE			123
MISCELLANEOUS			125
CURRENT NAVAL AND PROFESSIONAL PAPERS.....			136

FRANCE

FRANCE'S POST-WAR POLICY.—Député Le Cour Grandmaison, who played a prominent rôle in the last naval debate, and as ex-officer *de vaisseau* may be considered as representing the inward opinion of the French naval service, has done me the kindness of stating at length his views which follow:

"The naval policy is part and consequence of the foreign policy of any country. Now, the political outlook in Europe and elsewhere is not such as to enable France to do without a navy, although to heal her wounds must be her first care. By and by she will be able to devote more attention to her economical and intellectual expansion in the world at large, all things being impossible without a thriving mercantile marine and an adequate *flotte de combat*.

"Therefore the sea claims our immediate attention. We have to meet to-day's requirements and prepare for to-morrow.

To-day the limited naval expenditure must be employed militarily, for a tangible military return. We must go back to the sound principles governing the utilization of navies, and remember that the "*flotte de combat*" is the *raison d'être* of Admiralties, arsenals, and prefectures maritimes, and is the main, the only, thing to consider, and also that it must comprise only '*unités vraiment modernes*' in keeping with Admiral Gervais' precept: '*Un homme fort vaut mieux que deux hommes faibles.*' Consequently, '*tout doit être subordonné à la flotte active,*' and a bona-fide, efficient battle fleet requires to be fully armed and manned all the year round, to have the necessary sea practice and to be thoroughly trained in every respect, *entraînée à fond*. Mercilessly sacrifice all unwarworthy units, that might make illusion on paper, but can only provide in war '*des Good Hope ou des divisions Nebogatov.*' Efficiency resides in superior quality. Strive with every nerve and every sou to obtain superior quality rather than mere numbers.

"Similarly, in what regards coast defence, do away with false pretence and make-believe; do not disperse your efforts, but, instead, concentrate them in making Brest, Bizerta, and Toulon truly formidable from both the defensive and offensive standpoint, and strongly organize the Seine, Loire, and Gironde estuaries. No stationary brick-and-mortar policy, but up-to-

date mobile defences, consisting of heavy and quick-firing guns on rail or motor trucks, of torpedo, mining, and aerial flotillas, that can at all times become available where their presence is needed.

"As to new construction, we cannot do better than consult the lessons of past experience. There alone is to be found firm, solid ground, as noted by Admiral Jurien de la Gravière so far back as 1845. Number is not everything; far more vital is it to excel all likely opponents in the designing, constructing, and training of individual warships for action. So much for to-day.

"But we must prepare for to-morrow—that is, for the day when the national prosperity will enable us to have number, besides quality, ever keeping in mind that maritime expansion is not susceptible of improvisation, and that foresight and continuity of views and efforts must without delay pave the way for the recruiting and training of a much-enlarged personnel, and for the rapid and economical construction of up-to-date instruments *d'offensive* of superior power, which will mean unfailing watchfulness and untiring activity on the part of the naval authorities responsible for the Intelligence Department and for constructional progress. The whole naval organization itself must move with the times, since it has for *raison d'être* 'l'application, à des situations sans cesse modifiées, des principes immuables de l'art militaire.' It must be the soul that animates the whole naval body."

The Leygues programme (1918) comprised six scouts of 4900 tons and 12 destroyers. Minister Landry (1920) announced in July last that he would order in 1920-21 six modified *croiseurs légers*, to be second to none of their class, plus 12 super-destroyers, 15 destroyers, and 35 submarines. In August he actually ordered in the state arsenals of Cherbourg and Toulon 11 submersibles of some 1100 tons.

Député de Kerguézec, Rapporteur du Budget de la Marine, who had not enough sarcasm for the policy and inferior *croiseur* of ex-Minister (now Premier) Leygues, has obtained the agreement of the Commission de la Marine and of the Conseil Supérieur for the discarding of the modified Leygues programme, which he judiciously holds to be inadequate, as being made up of "*croiseurs et torpilleurs sans vitesse, sans armement, sans protection, et inférieurs aux bateaux similaires étrangers*"—a contention only too well founded.

As a consequence the French naval programme is to include:

- (1) A strong "*défense fixe des côtes*" by means of heavy guns and super-cannon;
- (2) A powerful aerial fleet;
- (3) Two dozen destroyers of superior power and speed;
- (4) 100 submersibles *offensifs*;
- (5) Super-cruisers, "*extrêmement rapides, puissamment armés et fortement protégés*"; in short, super-Hoods, fit to tackle any comer on the ocean, capable of commanding respect from enemies and friends alike (and the Section Technique is known to be preparing designs for super-Hawkins at the same time as for battle cruisers, with armaments of 194 and 240 mil.).

The intention is to spend 5,000,000,000 francs within five years to realize this plan which, Monsieur de Kerguezec contends, will enable France "*de regarder l'avenir en face*" (to face all likely eventualities). The Breton député feels humiliated at the remembrance of France's unpreparedness in 1914 and of the timely assistance offered by the supreme British Navy. "*Ces jours de cruelle angoisse*" he does not want to live again.

Truly the naval debate cannot fail to be lively and interesting.—*The Naval and Military Record*, Nov. 17, 1920.

FRANCO-ITALIAN RIVALRY.—There is on the part of those who are framing the French naval programme of to-morrow a tendency to overlook the Italian factor and the requirements of the Mediterranean situation. Thus members of the Conseil Supérieur and influential *députés* have just been

making for their own use an interesting picture of the naval world of to-morrow, in which there is no place for Italy; no place, in fact, for continental powers, sea supremacy being destined henceforth to be a bone of contention solely between the United States of America, Great Britain, and Japan, the only rôle of France, besides protecting her coasts, amounting to putting a squadron of six to ten ocean battle cruisers at the disposal of one of the parties when the day of reckoning comes that will decide whether or not Britannia is to retain the trident of Neptune. And it is for ocean duties that the new *croiseurs légers* and submersibles have been designed, whilst the projected *cuirassés*, to mount 450 mil. guns (18-inch), are to be provided with ample radius of action, and to have Brest rather than Bizerta for headquarters.

But despite the official endorsement by the Rome Admiralty of the doctrines of *la jeune école*, the peninsula is not by any means giving up its traditional ambitions on the sea. A recent number of the "*Rassegna Marittima*" tells us that Mediterranean supremacy belongs by right to Italy, that has inherited the rights and traditions of the Rome, Venice, and Genoa Republics of old, and talented publicists are proclaiming that the time has come for Italy to put into practice the policy recommended by Cavour and Mazzini, viz., "Predominance in the Mediterranean must be the constant thought of Italy, the main preoccupation of its Ministers." This political creed was adopted by the Cabinet of Florence so far back as 1838, though as a matter of fact Napoleon, in creating for his son the kingdom of Italy, stated that "*la première condition d'existence pour la future monarchie Italienne sera d'être une puissance maritime, afin de défendre ses côtes et de maintenir son autorité sur ses îles.*"

As soon as the actual kingdom of Italy had been cemented together, mostly with French blood shed freely at Magenta and Solferino, the vital need of sea power never ceased inspiring journalists and poets. A remarkable work, "*Maris Imperium Obtinerdum*" (1883), showed how Italy, from its geographical position, lives and dies by the sea, nearly to an equal extent with England, and advocated the construction of a fleet of superior speed, supported by numerous torpedo flotillas. As was pointed out by Admiral di Saint-Bon, defence means defeat for a power with the geographical situation of Italy, which has its finest cities at the mercy of bombardments from the high sea, and, besides, needs safe communications along its coasts to make up for a deficient railway system. In this respect, and when are considered the important islands of Sicily and Sardinia, no European nation is more dependent on the sea, with the exception of Great Britain. But sea power means great financial expenditure, and, of course, the able men, who, like Saint-Bon and Commandant Cottrau, undertook some 40 years since the framing of a policy adapted to the special naval needs of the peninsula, saw from the first the impossibility of competing in numbers with either Great Britain or France. And so they gave up all thought of repeating the experience of Lissa, where a fine Italian fleet was defeated by an Austrian force very much inferior in number and quality; they loathed the very idea of *bataille d'escadre*, and prepared the "war of the poor against the rich, of the fast cruiser against the unwieldy line-of-battle ship, of the torpedo against the gun, of isolated encounters and rapid bombardments, something on both the lines of Admiral Aube and Lord Fisher. This noteworthy programme, that was openly aimed at France, was practically realized from 1880 to 1890, when Italy arrayed a fleet including the two 15,000-ton and 18-knot *Lepantos* and the three 14,000-ton and 18-knot *Sardegñas*, superior in speed and caliber to the Toulon squadrons, that comprised a larger number of thickly-armored 10,000-ton ships of 14- and 16-knot speed. In an artillery duel at short range on conventional lines the French would have won; on the other hand, the faster Italian division could have done what it pleased against Gallic shipping, and would have, for a time at least, interrupted communications between France and Algeria. Thus it is no exaggeration to say that, some 30 years since, the

Italians had the mastery of the Mediterranean in their own hands. It was only for a short time. With the completion of the famous Dupuy de Lôme (1891) (6400 tons, 20 knots, 8 guns of 7.6 and 6.5-inch bore, all enclosed in turrets) and of the five smaller Pothuau-Charners of 19 knots, and also of the fine light cruisers of the Surcouf-Descartes classes of 20-21 knots, without mentioning the remarkable *cuirassés* of the Brennus-Jauréguiberry classes, France regained towards the end of the last century an absolute supremacy over her Latin sister; and since then it has never lost it, at least so far as gun power is concerned. The *cuirassés* of the *Patrie*, *Danton*, *Courbet*, *Bretagne* series were, on the whole, better instruments of offence than their Italian contemporaries of the *Brin*, *Roma*, *Dante*, and *Doria* classes, and similarly the 14,000 and 12,700-ton *croiseurs cuirassés* of the Quinet-Ferry types were faster and also better protected than the 10,000-ton Italian armored cruisers of the *Pisa* type, notwithstanding the good points of the latter.

At the same time, there is little to crow about in the present superiority of the Gallic Fleet over the Italian. With half the naval expenditure of France the maritime authorities of the peninsula have got a better return for their money. The contention of the Roman Admiralty in 1919 that the Italian Navy had reached the first rank on the continent caused Frenchmen to smile and shrug their shoulders, and, of course, so far as gun power is concerned, the seven *Bretagne-Courbets* of 24,000 tons, three of which are armed with 13.4-inch weapons, represent higher value than the five *Doria-Cavour-Dantes* of Italy. But if speed has really in practice the strategic and tactical importance which many believe, the Italian battle fleet could make good use of the two knots superiority it possesses over the Toulon Armée Navale, when are remembered poor steaming qualities of the Niclausse-boilered ships. In this respect the discarding of the 22-knot quadruple-turret Normandies deprives France of the absolute supremacy in the Mediterranean; and it is also to be noted that the five cruisers France has received from Germany and Austria appear to have been more "*sabotés*" than the war spoils that have rewarded Italy for her belated intervention in the conflict. Meanwhile, and for a few years to come, speed superiority in the Middle Sea will belong to Italy. Against this fact the eloquence of the gentlemen of the Commission de la Marine and the fine programme-making and grand paper reforms that for the last two years have replaced action in the counsels of the navy can, of course, do little.

Happily it is the opinion of not a few naval men that the Mediterranean is a special sea, in which speed can be of no use. Battle-cruisers were rejected in 1912, and again in 1914, for that very reason. In such narrow waters, studded with islands, continuous steaming at 30 knots would be both a risky and expensive pastime, and in the words of the late Monsieur Pelleton, Gallic ratepayers are far too sensible to spend "*l'argent en fumée*." True the *Goeben* and *Breslau* put rather a different complexion on the matter, but then it is rightly observed that in a conflict between France and Italy the aerial factor would have the main say. Lastly, it is added, there is no fear of conflict, France coveting nothing of what Italy has.

Still, history shows that peace is not obtained by begging for it, and that the only safe way to secure it is to enforce it by superior power. The fact has to be faced that Italy is a young, growing nation, who modestly considers the heritage of ancient Rome as her due and national goal. The disruption of the Austrian Empire has only served to open a wider horizon in front of her. Now that she has got rid of her deadly enemy, mostly through French agency, she feels enabled to concentrate her whole efforts on naval expansion. "*L'appétit vient en mangeant*," and France now stands as the only obstacle in the way of the realization of Italian dreams. In this respect the tone of leading journals of the peninsula is significant. In addition to traditional jealousy of France, there is at work the hidden

hand of Boche land, that has, of course, every interest in fostering discord among the Allies of yesterday. "*Fecit cui prodest.*"

Taking it for granted that Italy will not fall a prey to Bolshevism, her naval assets at this stage are worthy of attention. Her human element comprises true seamen and dashing officers, her industrial capabilities are growing, and her geographical position commands both the Central Mediterranean and the routes from Bizerta to France.—*The Naval and Military Record*, Oct. 27, 1920.

THE FINANCIAL POSITION IN FRANCE.—During the past two years every possible fiscal arrangement seems to have been tried in France in the hope of settling upon a policy best suited to the altered conditions of trade and industry. As a means of bringing down the cost of living the free importation of foreign products was at first encouraged, and the result was satisfactory so far as concerned the greater cheapness and abundance of necessities; but as the rate of exchange continued to advance, and industries were suffering from a lack of work, the growing imports were regarded as an evil and the tendency toward a rigid system of protection became more and more pronounced, even to the extent of absolute prohibition. The immediate effect was to stimulate speculation and give a temporary spurt to business. The final result has been to leave industry in a worse plight than it was before. The present policy aims at ensuring a "balance of trade" by restricting imports and encouraging exports, and, judging from the monthly returns, it would seem as if it were being attended with a certain measure of success; but when it is remembered that the imports consist very largely of fuel and raw material and that the exports comprise manufactured goods which are usually declared for Customs at a greatly appreciated value, the returns make the situation of the export trade appear more satisfactory than it really is.

Meanwhile the rate of exchange continues to be highly unfavorable to France. The question of settling upon some economical scheme for bringing about a normal state of things in all countries suffering from an adverse exchange rate was specially dealt with at the Conference of the League of Nations in Brussels, when the highest expert opinion could see no way out of the difficulty beyond adopting the principle of commercial liberty and stimulating production for export. No European country can live except by an intense industrial activity and by the selling of produce and manufactured goods abroad, and it is obvious there can be no sales by countries which consistently refuse to buy. Before the war France prided herself upon being more or less self-contained, but experience has shown that she cannot live without foreign aid, and the past month has seen the precipitation of an industrial crisis in France that has been in preparation for a long while past. There is nothing radically wrong with the industries themselves except so far as concerns trades like motor car building, which depend largely upon foreign buyers. For the engineering industries generally there is an abundance of work if only the financial situation permitted of its being distributed. A visit to the devastated regions is sufficient to show that there should be no lack of constructive activity, and it is amazing that so little should have been done. It is true that in the manufacturing centers private initiative has brought some of the industries up to about their pre-war production, but the work of reconstruction in the hands of the state has dragged along with desperate slowness. Not only state undertakings, but even private enterprise, is now seriously affected by the financial crisis. The bottom has fallen out of the credit system upon which French business has always been based, for the bankers are very reluctant to discount paper, and when manufacturers have to pay cash for their raw material there are very few who can carry over until they get payments from customers. The only hope for the immediate future, therefore, lies in a revival of credits. Notwithstanding appearances, it cannot be said that France is impoverished. There is cer-

tainly a vast hoarding of money all over the country, but while held in reserve in private hands it does not represent a factor in the national recovery.

The resolution of the Brussels Conference in favor of commercial liberty has made a great impression in France, where the bewildering failures of the many fiscal experiments have left the public mind prepared for any change of a drastic character, and the sooner something is done to facilitate foreign trade the better it will be for the country's future. The state is doing its best to remedy the errors of the past when it issued paper currency without discrimination in the belief that it would be covered by the war indemnity. The new French loan aims at the withdrawal of a considerable quantity of this paper and the constitution of funds for the carrying out of reconstruction work in the devastated regions. This action should help to re-establish credit and will enable the state to pay for work already done and to give out contracts of which the engineering industries are badly in need; but even then it is hardly likely to improve the situation unless the government immediately adopts the recommendation of the Brussels Conference to institute a system of credits abroad whereby foreign firms shall receive bills guaranteed by the government as payment for machinery and other goods supplied to the devastated regions. The guarantee offered will be sufficient to permit of the discounting of these bills, which will be equivalent to cash payments.—*The Engineer*, Nov. 5, 1920.

GERMANY

GERMANY'S THIRD YEAR OF PEACE.—Familiar lamentations over the "harsh and inexorable" Treaty characterize German editorial utterances in the opening weeks of the third year of the "peace of defeat." England alone offered a ray of hope, we are told, in renouncing claims on German property as provided for in the reparation sections of the Treaty, and this decision of hers, says the Berlin *Freiheit*, is of the highest importance because it "makes possible the resumption of commercial relations," and such resumption in itself is so weighty a factor in the whole situation that "it is to be hoped the other Allied and associated governments will follow the example of England." The *Frankfurter Zeitung* suggests that the French would be acting much more sensibly if they imitated rather than criticized England, but "unhappily they see things from a wholly different viewpoint and place the right of might before everything." In bemoaning the Treaty the *Frankfurter Zeitung* declares that when the needs of a people are restricted by "ever new demands and threats . . . the joy in work and the will to reconstruct are crippled," and one should not be astonished "if disease makes further inroads and the capacity for effort is constantly diminished." This important daily from Germany's great financial center goes on to say that the "strongest giant" must collapse if not allowed the opportunity to recuperate, and reminds us that in the "frightful six years since 1914 the German giant has struggled and shouldered his burden with superhuman endurance." Instead of a solvent state, Germany has become a bankrupt state, according to this authority, and "all that remains to us, apart from German territory which has been mutilated by amputation, is our ability and wish to work and to make good." To do this, it is held, the Germans must have the necessities of life such as "enough food, houses, and clothes," so that they may possess the needed moral and physical energy to regain their equilibrium. What was bearable in summer is impossible in winter, laments the *Münchener Neuesie Nachrichten*, which declares that to starve and freeze through another winter, "while the shop windows are well filled," requires a command of will-power that no longer exists, and this daily proceeds:

"The income of most families barely permits the purchase of the mere necessities of life. There is no thought of buying clothing and household requisites, and if people doubt this statement, let them inquire in the milk-shops about the many families with children who are unable to buy their

milk-ration. Let them question teachers and school physicians so they may know the terrible malnutrition of our children, and how much they lack in clothing. All money goes for food, so that there is none left for clothes, linen, or shoes. Black despair broods over many families, especially in households that have been used to moderate ease and comfort. Can an old couple live now on the 3000 marks (\$45, formerly \$750) which constituted a sufficient competence to them in prewar days? Their lives have been ruined by the fall of money values. Thousands who live on annuities or pensions are in utter misery."

The Socialist Berlin *Vorwärts* says "the death-rate in Germany, especially among children, is known to the whole world," and infant mortality in the agricultural districts has reached figures no German would formerly have believed possible. The statistics of a school physician in Saxony show that in Euba two out of 301 children were found to be well fed and in Hertan only five out of 1143.

Among capable foreign observers in Germany there is no tendency to minimize the seriousness of her affairs, but at the same time we do discover a Germany not so hopelessly wrecked and ruined as some of her howlers over the Treaty would have us contemplate. Thus the Berlin correspondent of the London *Times* points out that socially Germany has progressed very considerably since the end of the war. The wave of deep despair that passed over the country was followed by a moral decline in every stratum of society, and its effects are still noticeable. It lasted so long, this informant reports, because of continued political unrest, and it "would not be safe to say that the last has been heard of adventurers who seek short cuts to their goal by methods of violence." The old aristocracy, the landed interests, and the industrialists still profess fear of a "Red" revolution, while, on their side, the working classes murmur a dread of another monarchist *Putsch*. But there are many signs of repair in Germany, and chief among them is "a desire to work." It is doubtful whether crime is more prevalent than it was before the war, but crimes are better advertised, and a false perspective is the result, according to this observer, who continues:

"There has been a decrease in crime since the beginning of the present year. Public morals were never very high in the great German cities, especially Berlin; to-day one would say from casual observation that they are as bad as ever, but not worse. These phenomena probably march with better employment and with a reawakening of the sense of civic duty as the result of a reaction from public disorder.

"In German cities there is always a scum that is driven to the surface by the forces of social intercourse. To-day it is very apparent in Berlin, though not so noticeable in Munich or Hamburg. It is this froth that forces itself upon the observation of the passing traveler, leading him to believe that it is the life of the place.

"One has to look below the surface to see it for what it is, and then one also finds the real stuff. This boiling scum is given off by the profiteer, who is perhaps the greatest social menace threatening Germany to-day. His gains come easily—a hundred thousand marks may perhaps be made over the telephone before lunch by the lucky holder of a few truck-loads of sugar—and they filter down through his parasites to go just as easily. But the restaurants and cabarets of Unter den Linden and the neighboring streets are as a small patch on a city of five millions. They are as nothing in a country of 70 millions, and one must look elsewhere for the real state of things. It is necessary to predicate at this length because shallow deductions are so constantly being drawn from this single feature of German city life. Nevertheless the constant flaunting of superfluous wealth amid amusement and vice has one very evil effect. It tends to prepare the field for the Bolshevik agitator, who is to-day more insolently active in Germany than anywhere else in Europe."

Yet there is a reawakened feeling for industrial and commercial energy among all classes, we are told, and agriculture, "still the largest industry in Germany," is, of course, best off. With the rest of Germany's industries the case is otherwise, and we read:

"Only in a few trades is there any briskness. There is still a great shortage of raw materials for many industries; one hears complaints of a lack of coal, and orders are not coming in from abroad. There is a great demand for increased capital, and it is being called up in millions. This is a necessary outcome of inflation.

"Just as in the moral field there are controversies at work tending to retard recovery, so there are in the province of industry new problems the effect of which is to maintain an atmosphere of unsettlement highly inimical to the resumption of normal trade. One of these is the question of the socialization of the coal-mines. In its present form the demand is a heritage of the general strike that followed upon the Kapp *Putsch*; a measure of socialization was part of the bargain between the trade-union leaders and the government for calling the strike off.

"It has descended, a hopeless heritage, to the present government. It is an embarrassment to the Cabinet and a constant drag on trade. While it hangs over the country it checks enterprise and development of fresh mining adventures, compelling caution where otherwise a bold policy would be dictated.

"Credit does not appear to present any great difficulty. Large firms, of course, are in a specially favored position with the banks, and small firms sometimes have to pay a rather severe rate of interest for accommodation. This matter is shortly to be regulated by the government, but meanwhile there does not seem to be any great outcry. German industry may, in fact, be said to have struggled to its knees. It has been a wonderful effort, and in it the German industrial and mercantile classes have shown all their old skill and persistence. Now it is all a question of winning back the old markets and finding new ones."

At the root of the whole matter of the revival of German trade lies the condition of German finances, we are told:

"The funded debt, which was about 5000 millions of marks in July, 1914, was 91,000 millions on November 1, 1920; and the floating debt, which was 400 millions in July, 1914, was 157,300 millions on November 1, 1920. The total debt is 287,800 millions, and by the end of the financial year it is expected to reach some 330,000 millions.

"But from end to end of Germany you will hardly hear the words 'state bankruptcy' even breathed. The loan interest is paid, the coal deliveries to the Allies are maintained, and thereby the mark continues to maintain a value. As long as it is worth anything or something, trade can go on, and the German merchant can keep a credit in some sort of real money to pay with."—*The Literary Digest*, Dec. 11, 1920.

GERMAN SUBMARINES.—Gives interesting data relative to the German submarines. The number built before and during the war was 568, of which according to Admiral von Capelle, 210 were lost and 183 still under construction.

The cost of building ran up from 4110 marks per ton in 1914 to 9000 in 1918. Captain Persius said 24 or 30 months were required for building an 800-ton boat, but the constructor Schurer says only 100 days sufficed for the first boat of the *UB* type and 7 months for the remainder. From the construction point of view the Entente Powers had nothing to learn. (Commander E. Normand, *La rivista Mercantile Italiana*, Sept., 1920.)—*The Technical Review*, Nov. 2, 1920.

GREAT BRITAIN

OUR DWINDLING CAPITAL.—Admiral de Chair's allusion to the rapidity with which the modern battleship or cruiser declines into obsolescence was a timely reminder that this country is living on its capital in the sphere of naval defence. And that capital is not by any means large. Anyone with a knowledge of warship values who scans the navy list to-day will perceive at once how narrow is our lead in ships of the strongest type and how soon we shall fall behind. The public cannot be expected to know the technical niceties of armour, protection, speed, and the other factors by which the tactical value of a modern man-of-war is determined. To them a dreadnought is a dreadnought, irrespective of its age, the caliber of its guns, the thickness and disposition of its armor-plate, or its speed at sea. But the expert naturally finds as much diversity among the world's dreadnoughts as formerly obtained among the pre-dreadnought fleets. It is understood that naval opinion in this country is almost unanimous as to the material elements that qualify a capital ship for inclusion in the first rank. Broadly speaking, those elements are: (1) A main battery of not less than eight guns, with a minimum caliber of 15 inches; (2) for battleships, such armor protection to vitals as will resist the heaviest A. P. Shell at ranges exceeding 12,000 yards, and nearly all-round bulge defence against torpedoes; (3) for battle-cruisers, a sea speed of at least 30 knots. Applying this standard, we find that it rules out all but six ships of the Royal Navy, the survivors being five Royal Sovereigns and one Hood. The five Queen Elizabeths are excluded because they lack bulge protection, though in other respects they are still very fine and formidable ships. The standard may be considered unduly severe, but it is based on actual war experience, and will be reached by at least 24 American and Japanese ships now building or authorized. We do not wish to labor the point, but would commend these figures to the attention of people who are still under the delusion that our lead at sea is assured for several years to come.—*The Naval and Military Record*, Nov. 17, 1920.

A GREAT NAVAL PHILOSOPHER.—It must be gratifying to the British peoples to know that the record of the Life of Mahan (Murray) should be written by one of themselves—one, moreover, who has not plunged into authorship before. Mr. C. Carlisle Taylor, formerly British Vice-Consul at New York, describes his new book as the overflow of an English heart full of admiration for an American who, by force of character, overcame well nigh insuperable obstacles and earned for himself in the eyes of the world the highest distinction yet accorded a naval philosopher. The far-reaching effect of Mahan's work upon the policy of nations is apparent to all. Here is an instance of the impression made by his writings and character upon an individual unconnected with the sea profession.

Passing over the information given about the family and home life of the great American admiral, his exceeding reserve and modesty, and his profound religious convictions, in regard to all of which Mr. Taylor's biography is valuable, the naval officer will find himself considering how far the teaching of Mahan affected the course of events in Europe. Mr. Taylor affirms that there is ample evidence that in the last few months of his life—and it may be recalled that he died after the war had been in progress only four months, on December 1, 1914, the Admiral suffered acute mental distress about the conflict and the part he had played, although entirely unpremeditated, in stimulating the growth of the German Navy, thereby helping to make possible the crime of August, 1914. Of the immense stimulus given to naval expansion in the Fatherland by the "sea power" series, there can be no question. The Kaiser, in a telegram dated May 26, 1894, said, "I am just now, not reading but devouring Captain Mahan's book; and am trying to learn it by heart. . . . It is on board all my ships and constantly quoted by my captains and officers." The manner

in which the Germans fastened on to this great fact of sea power, and the energy they displayed in expanding their fleet, must have amazed no one more than the quiet philosopher whose writings inspired them.

Two things can at least be said in this regard. Every penny spent upon the navy of Germany was a penny taken from the army. Secondly, when put to the test, that navy proved absolutely useless for its cardinal purpose. The only force which was able to do anything of real consequence in the war was the *U* boat, and even the power of the latter was never admitted and realized until long after hostilities had begun and when its best chance of success had passed. Mahan knew inwardly, moreover, that Germany must fail. He prophesized that submarines would not subjugate battleships, saw that Italy would abandon the Triple Alliance, held that sea power would be the deciding factor, and that the Germany Navy would surrender to the British Fleet; in all these forecasts his judgment was sound. Even more quickly than in Germany was his teaching assimilated by Japan, whose victory in the war with Russia was largely due to it. The author of the new life gives a table showing that in the twenty-five years after the publication of "The Influence of Sea Power upon History" the naval expenditure of the principal nations increased from 38 to 167 millions sterling. This is not, however, an entirely fair criterion, the increased cost of the bigger ships built being largely responsible. Nor can it be said that Mahan's books were the immediate cause of the revival of British naval strength, because Stead's "Truth About the Navy," inspired by Lord Fisher and others, preceded them, and the impetus of public opinion to restore the Fleet had already been given. But Mahan greatly helped the movement by the appeal his writings made to statesmen and laymen, and that he captured the national imagination was proved by the remarkable welcome from all classes afforded him when as captain of the *Chicago* he came to England in 1894.—*The Army and Navy Gazette*, Nov. 6, 1920.

UNITED STATES

"TENNESSEE"—OUR LATEST BATTLESHIP.—The battleship *Tennessee* (sister to the *California*) which was laid down at the New York Navy Yard in May, 1917, recently left for a "shaking down" cruise to Guantanamo, Cuba, at the conclusion of which she will be given her speed trials for acceptance by the Navy Department. Her principal dimensions are: length between perpendiculars, 600 feet; beam, 97 feet 3½ inches; mean draft, 30 feet 3 inches; normal displacement, 32,300 tons; and full load displacement with 31 feet of draft, 33,190 tons. Her motive power consists of a Westinghouse turbo-electric drive, with two main generators and four propelling motors. In the boiler room are Babcock and Wilcox oil-fired boilers, and her estimated shaft horse-power is 38,500. The main battery consists of twelve 14-inch, 50-caliber guns which are emplaced in four 3-gun turrets, all of which are mounted on the center line of the ship and are available on either broadside. The secondary battery, which is mounted in casemates on the spar deck, and upon the boat deck, consists of fourteen 5-inch, 51 caliber guns. For anti-aircraft defense there are four 3-inch guns. The *Tennessee* mounts two torpedo tubes, one on each beam, for firing the 21-inch torpedo. The complement of the ship is made up of 130 officers of all ranks, and 1281 men. An unusually large part of the displacement of the ship is given over to armor protection, the belt having a maximum thickness of 14 inches. The funnel bases are heavily armored. The port plates of the turrets are 18 inches in thickness.

A great deal of thought has been given to protecting the ship by limiting the inflow of water below water line, caused by shell fire or torpedo. Between the outer shell of the ship and the engine and boiler rooms, magazines, and other vital elements, there are several longitudinal walls of steel which are intersected by numerous transverse bulkheads. This provides the ship with a wide cellular belt, whose effect will be greatly to limit the

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,
AS REPORTED NOVEMBER 30, 1920

Type, number and name		Contractor	Per cent of completion			
			Dec. 1, 1920		Nov. 1, 1920	
			Total	On ship	Total	On ship
Battleships						
44	California.....	Mare Island Navy Yard.....	94.8	93.7	94.5	93.2
45	Colorado.....	New York S. B. Cpn.....	63.2	58.3	61.3	55.9
46	Maryland.....	Newport News S. B. & D. D. Co.	86.5	85.5	84.	83.
47	Washington.....	New York S. B. Cpn.....	54.1	45.3	52.7	43.4
48	West Virginia	Newport News S. B. & D. D. Co.	37.7	25.2	35.5	22.5
49	South Dakota.....	New York Navy Yard.....	17.6	9.8	16.2	8.
* 50	Indiana.....	New York Navy Yard.....	13.8	6.	12.8	4.6
51	Montana.....	Mare Island Navy Yard.....	15.1	7.3	13.2	6.2
52	North Carolina	Norfolk Navy Yard.....	18.6	11.3	17.4	10.3
53	Iowa.....	Newport News S. B. & D. D. Co.	10.9	7.6	9.4	6.6
54	Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	.5	....	....	....
Battle Cruisers						
1	Lexington.....	Beth. S. B. Cpn. (Fore River)..	3.5	.4	3.2	.4
2	Constellation	Newport News S. B. & D. D. Co.	2.6	1.1	2.2	.6
3	Saratoga.....	New York S. B. Cpn.....	8.	4.4	5.8	3.2
4	Ranger.....	Newport News S. B. & D. D. Co.	.9	.3	.8	.2
5	Constitution	Phila. Navy Yard.....	1.4	.5	1.2	.4
6	United States	Phila. Navy Yard.....	1.4	.5	1.2	.4
Scout Cruisers						
4	Omaha.....	Todd D. D. & Const. Cpn.....	81.5	73.9	78.1	68.9
5	Milwaukee.....	Todd D. D. & Const. Cpn.....	71.1	67.7	68.	62.7
6	Cincinnati.....	Todd D. D. & Const. Cpn.....	50.2	35.8	45.8	26.8
7	Raleigh.....	Beth. S. B. Cpn. (Fore River)..	30.2	16.4	23.	12.
8	Detroit.....	Beth. S. B. Cpn. (Fore River)..	28.8	15.	21.4	10.4
9	Richmond.....	Wm. Cramp & Sons Co.....	56.	....	55.	....
10	Concord.....	Wm. Cramp & Sons Co.....	55.	....	54.	....
11	Trenton.....	Wm. Cramp & Sons Co.....	34.	....	32.	....
12	Marblehead.....	Wm. Cramp & Sons Co.....	33.	....	31.	....
13	Memphis.....	Wm. Cramp & Sons Co.....	26.	....	24.	....
Miscellaneous						
	Fuel Ship No. 18, Pecos.....	Boston Navy Yard.....	47.	44.	42.5	39.
	Gunboat No. 22, Tulsa.....	Charleston Navy Yard.....	41.8	28.1	37.1	25.3
	Hospital Ship No. 1, Relief.....	Phila. Navy Yard.....	99.4	99.2	99.	98.8
	Amm. Ship No. 2, Nitro.....	Puget Sound Navy Yard.....	99.6	98.5	99.4	98.2
	Rep. Ship No. 1, Medusa.....	Puget Sound Navy Yard.....	45.8	35.6	42.7	32.
	Destroyer Tender No. 3, Dobbin.....	Phila. Navy Yard.....	41.4	41.	36.5	36.
	Dest. Tender No. 4, Whitney.....	Boston Navy Yard.....	6.5	2.5	5.	2.
	Sub. Tender No. 3, Holland.....	Puget Sound Navy Yard.....	8.6	....	7.5	....
	Aircraft Tender, Wright.....	Tietjen & Lang	*13.	....	65.	....

* Battleship No. 50, keel laid November 1, 1920.

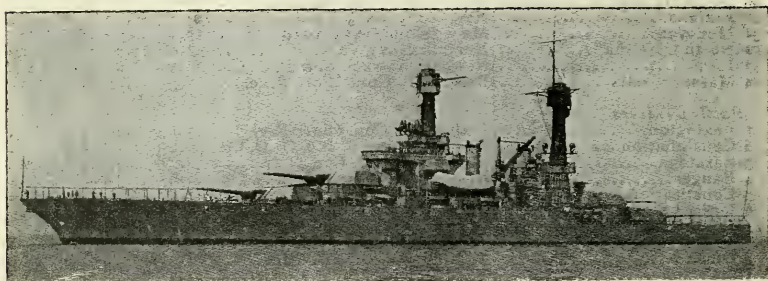
In addition to the above there are under construction 39 destroyers, 47 submarines, and 2 sea-going tugs. Authorized but not under construction or contract, 12 destroyers, 7 submarines and one transport.

There were delivered to the Navy Department during November, 6 destroyers.

flooding which results from the successful blow of a torpedo. Also, the vitals of the ship are protected from shell fire by several stout steel decks which, it is hoped, will serve as shell bursters and by breaking up the shells prevent any penetration below the protective deck.

During the service of our Sixth Battle Squadron with the Grand Fleet in the North Sea, there was a very free exchange of ideas between our own and the British navies, as there was also between the various departments of the two navies, and when our squadron returned to this port they presented to American eyes several new features which they had brought with them from the area of naval operations. Several of these features have been embodied in the *Tennessee*, with many improvements worked out in our own department. Among our own developments is the large enclosed structure at the mastheads which takes the place of the old, open, fire-control platforms as they were known in our navy in pre-war days. These enclosed "tops" were necessitated by the improvements in director firing, in which the aiming of the guns is controlled by officers stationed in lofty positions and preferably at the masthead.

In no direction has there been such progress as in this matter of gunnery. Both in the British and in our own navies some really wonderful



OUR LATEST BATTLESHIP "TENNESSEE," LEAVING NEW YORK FOR A SHAKING-DOWN TRIP, PREPARATORY TO HER TRIALS.

Length, between perpendiculars, 600 feet; 97 feet $3\frac{1}{2}$ inches; draft, 30 feet 3 inches; displacement, 32,300 tons. Motive-power, Electric-drive. Horse-power, 38,500. Battery, twelve 14-inch in four 3-gun turrets, fourteen 5-inch. Armor, belt, 14 inches; turrets, 18 inches; complement, 1411 officers and men.

instruments have been devised for finding the range and bearing of the enemy and keeping on the range in spite of the deviation of one's own or the enemy ship. Among these may be mentioned range-finding instruments, target bearing instruments, and those for range keeping; and, of course, there is the form of telescope known as the directorscope. It has become necessary to give ample protection both to these instruments and the officers and men who operate them. This accounts for the remarkable double-deck structure which is such a conspicuous feature at the head of each of the lattice masts of the *Tennessee*. It will be noticed, by the way, that these masts are very much more massive in construction than those of our earlier ships. This change is due to the necessity of damping out as quickly as possible the intense vibrations which are set up in the structure of a battleship and particularly at the mastheads, when a salvo from its big guns is fired. Also, it is desirable to reduce to a minimum a certain amount of springing of the masts, due to inertia when the ship is rolling or plunging heavily. The British use a combination of three very stout steel masts arranged in tripod form. Doubtless, this gives a stiffer plat-

form; but in the opinion of our Navy Department, the tripod mast could be more easily shot away or seriously disabled than our lattice masts, which are made up of a very large number of spirally grouped steel tubes.

Another development of the war is the use of director firing, not merely for the main battery, but also for the 5-inch torpedo battery. These, of course, have to be separate installations and hence we have the two separate director rooms, one above the other.

Another conspicuous feature which will be new to American eyes is the large clock face at the front of the foremast. This is a British device which gave satisfaction. It is used when a fleet is steaming in column to indicate to the ship ahead and the ship behind (there is another clock on the rear of the main mast) the speed at which the ship is traveling—a necessary precaution in keeping proper distance and station. At the foot of the foremast and some distance ahead of it is a large covered range-finder, and below this is the navigating bridge. Below the bridge where we see the circular port holes is the chart house which is surrounded by the signal bridge. A group of signal men will be noticed in the right-hand corner of this bridge, with the racks for the signal flags behind them, and the signal halyards leading up to the signal yard at the top of the mast. Forward on this bridge will be noticed the top of the conning tower.

The *Tennessee* and *California* are the last ships that we shall build carrying the 14-inch gun. The next class, consisting of four vessels, the *Colorado*, *Maryland*, *Washington* and *West Virginia*, will be about 1000 tons larger than the *Tennessee*; but otherwise, so far as general appearance is concerned, will resemble her. The principal difference will be that eight 16-inch guns will take the place of twelve 14-inch guns, and that a great weight of protective armor will be employed.—*The Scientific American*, Nov. 13, 1920.

MERCHANT MARINE

THE LABOR QUESTION AND THE MERCHANT MARINE.—The question of labor, so far as the shipping trade is involved, applies most directly to the manning and officering, victualling, loading and discharging of the ship itself. Indirectly, of course, the trade is affected by nearly all labor conditions, from the crews of towboats in seaports, to the wages of farm hands in Ekaterinoslav, Russia, or wool packers in Woolloomooloo, Australia. So far as this latter feature is concerned, we pass it for the present.

The matters of loading and discharging, harbor charges and port expenses in general, do not affect ships of one nationality differently from those of others. Foreign ships in our own ports receive approximately the same treatment as our own; and the converse is broadly true of our own ships in foreign ports. Stevedores, for instance, make the same rates for English as for American ships in the port of New York, and expenses in general are the same. Conversely, American ships trading to the great ports of Europe stand on about the same basis as any other nationals. And this is true in the most important trade routes of the world from Norway to Australia. There are some ports and some small matters in which there is discrimination, but we need not enter into these for our present purpose. Where such differences exist they are mostly for purposes of raising revenue, rather than protective, and generally any protective result is incidental and not very important.

We will, therefore, consider for the moment only the cost of manning, officering and victualling ships, and compare such costs in the case of American ships, with those of our chief competitors.

The figures used are based upon the data of the American Steamship Owners' Association—and compare crew lists and wages for a ship of 8800 tons total deadweight capacity on the respective basis of American, English, Norwegian and Japanese scales. The actual figures are as of the summer of 1919, but as the relative costs have not greatly altered in the

interim these figures (though not exact) should be sufficiently so for any use that we shall make of them.

In brief detail the comparison is as follows:

Comparative wages of Department Chiefs:

	American	English	Norwegian	Japanese
Master's salary	\$357.50	\$258.00	\$268.00	\$255.00
Chief Engineer	332.50	233.00	221.00	220.00
Chief Steward	135.00	97.00	156.00	35.00
	<hr/> \$825.00	<hr/> \$588.00	<hr/> \$645.00	<hr/> \$510.00

The above illustrates the differences in apparent wages of the chief officers in the three main departments of a ship's operation. But it is fallacious in one vital respect. It reckons all currencies at the normal rate of exchange and makes no allowance for the fact that only two nations out of the four pay their wages in gold; the other two pay in depreciated paper. Our own country is on a gold basis, and pays seamen in gold or its equivalent. England and Norway pay their seamen in paper, which is to-day at a heavy discount as compared with gold.

Specifically the gold value of a Norwegian kroner is 26 cents and Norwegian paper currency can be bought in this market at around \$13.80 per 100 kroner. Sterling has been around \$3.40 to the pound as against a par value of \$4.8665.

Therefore the par rate of exchange for Norwegian and English exchange used in the above comparison is misleading. The English ship figures say £121 sterling; and the Norwegian say 2481 kronen. At current rates of exchange the comparison would, therefore, stand thus:

Comparative wages in gold of Department Chiefs:

American	English	Norwegian	Japanese
\$825.00	\$411.40	\$342.38	\$510.00

The following will indicate the relation of wages in two departments (all in terms of U. S. gold):

	American	English	Norwegian	Japanese
Able seamen	\$85.00	\$48.96	\$27.69	\$31.00
Oilers	95.00	52.46		48.00
Coal passers	75.00	48.96	26.02	25.00

Figuring the total crew and wage lists at present gold values of the different currencies, the comparison works out as follows:

	Total Crew	Total Cost	Per Captain
American ship	48	\$5,315.00	\$110.73
British ship	45	2,750.00	61.11
Norwegian ship	40	1,794.00	44.85
Japanese ship	59	2,869.00	48.47

So far as British and Norwegian ships are concerned, the value of comparisons is, no doubt, clouded by the unusual relation of those currencies to gold. With more normal rates of exchange, the differences as compared with the American gold scale would be narrowed, though not eliminated.

At normal rates of English and Norwegian exchange (the pound at \$4.86; and the kroner at 26 cents, the following results will be shown:

American	48 men, total cost	\$5,315.00	
British	45 " " "	3,924.00	per cent. of Am. 74
Japanese	59 " " "	2,869.00	" " " " 54
Norwegian	40 " " "	3,378.00	" " " " 64

but normal rates of exchange seem a long way off at the moment, and our competition to-day is not only with a lower scale, but with cheaper currencies.

Japanese currency is, however, on a gold basis and a fair comparison as to wages, and subsistence may, therefore, be made. Subsistence on American ships to-day will run about \$1.25 a man per diem or \$37.50 a month, including all ranks from messboy to captain. On the same basis Japanese subsistence does not exceed 50 cents a man per diem or \$15 a month, according to the best information obtainable.

Our theoretical ship of 8800 tons, therefore, spends for subsistence as follows:

Under American Registry, 48 men at \$37.50 a month.....	\$1,800.00
“ Japanese “ 59 “ “ 15.00 “ “	885.00

Basing the comparison on the figures already arrived at, we reach the following results:

Comparison of wages and subsistence:

	Wages	Subsistence	Total
Japanese	\$2,869.00	\$ 885.00	\$3,754.00
American	5,315.00	1,800.00	7,115.00

a difference of \$3361.00 a month on these two items; or say an American handicap of \$40,332 per annum. This would figure out \$4.46 a ton of total deadweight capacity, or (say) \$5.76 a ton of cargo carried. Based on five voyages per annum the difference in favor of Japanese register would be about \$1.15 a ton of cargo carried a voyage, or say \$8000 a voyage.

This much is obvious and easy to calculate. The larger factor, which it is not possible to state exactly in figures, involves the question of the comparative living scales of workers directly tributary to the business of shipping. It would be easy to tabulate a mass of figures concerning this matter, but it is doubtful whether such statistics would be profitable to us. The main points in such a comparison, however, stand out rather clearly. It may be assumed that the relative differences (in terms of equal exchange—that is to say, in gold) which mark the two costs of labor and subsistence will apply, measurably, to costs of labor directly employed in building, equipping, repairing, maintaining, and operating the ships from the shore end.

This, as stated, is only a general consideration, and we shall not attempt to estimate exactly the differences in cost of ship operation, due to the difference in the entire level of land wages, as applied to the two nations. But it is at least reasonable to assume that as a minimum, the differences caused by all other contributory labor factors will be approximately equal to the difference in wages and operation. This would about double the advantage of the Japanese ship as compared with the American and on a ship of this size, namely, 8800 tons total capacity, would indicate an advantage to the Japanese ship of \$80,000 per annum, or, based on five voyages, \$16,000 a voyage.—*The Nautical Gazette*, Nov., 1920.

BRITISH AND AMERICAN SHIPBUILDING.—It is satisfactory to note from the valuable shipbuilding statistics issued by Lloyd's Register of Shipping on October 19, and published elsewhere in the present issue, that the increased share of new mercantile tonnage production once more secured by British shipbuilders after the conclusion of the war has been more than maintained during the quarter ended September 30, 1920. At June 30, last there was under construction throughout the world merchant shipping of a gross tonnage of 7,720,904, of which 3,578,153 tons (46.3 per cent) were building in the United Kingdom, while the British Colonies and all foreign countries had in hand 4,142,751 tons, or 53.7 per cent. Three months later—at September 30—the corresponding figures were:

The world	7,565,171 gross tons.
United Kingdom	3,731,098, or 49.3%
Other countries	3,834,073, or 50.7%

It will thus be seen that, while during the three months the merchant shipping under construction in the United Kingdom increased by 152,945 tons gross, foreign shipbuilding (excluding German) diminished by 308,678 tons. Figures from Germany are not yet available.

On the other hand, British shipbuilders have still some lost ground to recover before they once more occupy the same favorable position as they had prior to the war; since at June 30, 1914 (a little over a month before the commencement of hostilities, the merchant shipping under construction was as follows:

The world	3,162,890 gross tons.
United Kingdom	1,722,124, or 54.4%
Other countries	1,440,766, or 45.6%

The world's total at September 30, 1920—7,565,171 gross tons—is 155,733 tons lower than the figures at June 30, 1920, and 483,411 tons lower than the record figures reached at the end of September, 1919, but 4,402,281 tons higher than the total at June 30, 1914.

As regards the United States, an enormous decrease has taken place in the tonnage under construction in that country during the last 18 months. At March 31, 1919, 4,185,523 tons gross were actually building there; whereas at September 30, 1920, the tonnage building had fallen to 1,772,193, a decrease of 57.7 per cent. In the United Kingdom during the same period the figures increased from 2,254,845 tons to the present record total of 3,731,098 tons, an increase of 65.5 per cent. An analysis of the 312 vessels of 1,772,193 tons gross building in the United States at September 30, 1920, is given in Table I.

TABLE I.—SHIPS BUILDING IN THE UNITED STATES

	Steamers and motor vessels		Sailing vessels	
	Steel	Wood	Steel	Wood
Atlantic Coast	1,229,017	1,500	4,354	6,000
Gulf Ports	141,553	8,560	—	5,400
Pacific Coast	331,150	8,450	—	2,500
Great Lakes	33,709	—	—	—

—*The Shipbuilder*, Nov., 1920.

MAKING PASSENGER VESSELS FROM OUR OLD DESTROYERS.—The recent offering for sale by the navy of three gunboats and two cruisers brings to mind the fact that recently the New London Ship & Engine Co., of Croton, Conn., a subsidiary of the Submarine Boat Corporation, bought from the navy, four destroyers, each about 10 years old, with the idea of converting them into passenger vessels. It is understood, however, that the plan was not regarded feasible in view of the construction of the ships and, although the shortage of passenger ships still exists, the matter has been held in abeyance.

Outboard and inboard profiles prepared in connection with the alteration plans show the good appearance these vessels would make as converted passenger ships and also what an efficient arrangement could be worked out, using the vessels on a night run. An arrangement was also worked out for a day run where the passengers would not remain on board over night and the reduction in crew accordingly would permit additional space for passengers and larger public spaces. The sea-going qualities of these destroyers was reported as being excellent and this was demonstrated while they were on duty in the North Sea during the war.

The arrangement for a night run contemplated installing 18 state rooms on the main deck and 27 on the lower deck, providing for 90 passengers, two in a room. In addition on the main deck there were to be the main saloon, smoking room, toilets, crews' galley and messroom, steward's and

purser's office, and the chief engineer's and assistant engineers' and pursers' staterooms.

Crew's quarters were to be on the lower deck, with the dining-room, galley and pantry, stewardesses' room and baggage room in the extreme stern. On the upper deck the pilot house, captain's and mates' staterooms, and radio house were to be installed.

The arrangement for a day run contemplated comparatively few state-rooms, the public spaces, officers' and crew's quarters being made considerably larger.

These destroyers were fitted with water-tube boilers and steam turbines, and it was proposed to remove them and install Nelseco Diesel engines. This would eliminate the fire-room force and also reduce the engine-room force which, together with removal of boilers, would provide more space. The reduction in crew and the use of Diesel engines would naturally speak for economical operation. Three 1000 horsepower engines could be installed giving a speed of 21.2 knots; however, in view of the higher cost of operation at this speed, it was recommended that engines be fitted giving a speed ranging between 15 to 18 knots.

The steering gear, windlass and generator were to be operated by a donkey boiler fitted in the forward end of the engine-room. In the forward hold there were to be trimming tanks, chain locker and fresh water tank, and in the after hold trimming tanks and engine stores. Fuel oil tanks, feed water tank, galley storeroom and cold storage space was to be amidships in the hold.

The overall length of these hulls is 203 feet 10 inches, beam 26 feet, depth 16 feet 4 inches, drawing about 8 feet of water and displacing about 700 tons. The length of the raised forecastle is 73 feet, giving a freeboard forward of about 17 feet.—*The Nautical Gazette*, Nov. 13, 1920.

JAPAN

"IF AMERICA AND JAPAN WENT TO WAR"—A JAPANESE VIEW.—Lieut.-Gen. Kojiro Sato, of the Japanese Army, is giving serious thought to a possible war in which Japan will be matched against America. He is the author of a series of articles in a Tokyo newspaper, *Hochi*, in which he gravely discusses the possibility of an American invasion. Supposing America invaded Japan, he gets some comfort out of his remarkable idea that "the American troops, unaccustomed to warfare in hilly country, would find the greatest difficulty in resisting the Japanese." Both Guam and the Philippines furnish possible naval bases, he points out, for an American attack on the Japanese nation, but these islands would be so liable to attack by the Japanese Navy that he believes America would hesitate. "Putting Japan in the place of America, she would not shrink from waging war in the face of these difficulties," he observes. "But I do not think that America can summon up the courage to disregard these obstacles and think of sending an expedition to a country so far removed from her as Japan." Thus the conclusion of the article is pacific, even if the grounds are not altogether complimentary to American valor.

The Japanese general is quoted in the Peking *Daily News*, which is no friend of Japanese militarism, and doubtless makes the most of the Japanese Bernhardt, whom it seems to have discovered in the person of General Sato. To quote from *The News'* translation of one of the General's recent articles:

"When America's program of naval extension is completed, she will have 40 old and new battleships, 37 cruisers, 258 torpedo destroyers, more than 300 submarines, and 5000 seaplanes. There will be a corresponding increase in the mercantile shipping, which, on the completion of the plans now under way, will enable America to put in commission 1039 ships of various descriptions, totaling 5,924,700 tons. America had an army of 120,000 men in pre-war days, but it is contemplated to increase the forces to

300,000 at a bound. While she is thus striving to augment her national defence, America is steadily going on with the scheme of giving military training to 650,000 young men of military age every year. Looking at the American preparedness as indicated in the circumstances above mentioned, one is apt to come to the conclusion that Japan is no match for America in point of military strength.

"But what was the result of the battle of Bunei? At the sight of Genghis Khan, who had carried everything before him in Europe, most of the observers here dwelt on the necessity of taking precautionary measures against emergencies arising from the ambition of the Mongolian chieftain. Kublai Khan, who had succeeded in his plan of world-conquest, had brought under his control the Chinese continent, and had turned to us to satisfy his insatiable territorial greed. Japan was in a far less advantageous position from a military point of view than she is now as against America. And yet the result of the conflict ended in victory for Japan. In considering the causes of Japan's victory in this battle, some observers attribute them to the invisible help of Providence, but these observers clearly reveal their ignorance of the condition in which Japan was at that time. How Japan, in order to stem the crushing force of Kublai Khan, endeavored to strengthen her defense and armaments, can be seen by inspection of the historic remains. Suppose that Japan had had no Tokimune, the attitude of Japan toward Kublai Khan would have been swayed by the negative policy of the authorities, and her territory would have passed under the control of China.

"History repeats itself. In the era of Ansei, Japan was confronted with a similar danger from outside, and in this conflict Japan, notwithstanding innumerable difficulties, ultimately gained the day. If there was anything that contributed to the victories over foreign enemies, it was the spirit of bravery. Japan is now face to face with a menace from America. Have the Japanese the courage to brave the situation—the courage which helped their fathers to frustrate the efforts of foreign countries to subdue Japan in past times? It is my settled conviction that if Japan to-day had such great men as Tokimune, Saigo, Ckubo, or Kido, to inspire the flagging spirit of the people, I have no doubt they would be able to show a united front to the enemy.

"We hear sometimes that the Japanese were never more devoid of manly and chivalrous spirit than to-day, and that, considering the state of the public mind, it is doubtful whether the Japanese of to-day are capable of rising to the occasion. But these misgivings will be found groundless in consideration of the condition of society in those days when Japan was menaced by Mongolians. Needless to say, the present-day Japan has much need for a great man, but there is another means of arousing the public opinion in regard to Japan's attitude toward America. If an appeal is made to the loyalty of the people, I have no doubt that the same degree of patriotism which was aroused by the Nikoliaevsk affair will be shown in regard to the menace from America."

From the middle of the Hojo era down to the closing days of the Shogunate, the general observes, Japan was reduced to a very precarious position, viewed from the point of view of foreign politics, but the fact that foreign countries did not attempt anything in the way of conquering Japan was due to its geographical position as well as to the bravery of its people. He goes on:

"Although the Japanese of to-day cannot be esteemed braver than their forefathers, they have not yet lost entirely the virtue of courage, which is inherent in the Yamato race. As for the geographical position of Japan, she is as difficult of access as ever. Even if Japan had no navy, it is highly improbable that any foreign country could land troops on her shores, however strong that foreign country might be. Again supposing that a foreign country succeeded in invading Japan, all classes of the people, young and old, would unite against the invaders, and it is unthinkable that the invading

troops could be able to hold the conquered territory for any length of time. Unaccustomed to warfare in hilly country, the American troops (supposing America invaded Japan) would find the greatest difficulty in resisting the Japanese, and it is probable that they would ultimately be compelled to evacuate the occupied territory by the almost insuperable difficulties attending the transportation of ammunitions.

"Although the Japanese Navy is inferior to the American, America would find it an absolute impossibility to land her troops in any part of the Japanese territory, so long as there exists the Japanese Navy. Even if America possessed the greatest navy in the world, she would not think of conquering Japan. As long as there remains the last man in this land ready to lay down his life for his country, the American Navy, however strong, would have little chance of possessing any part of Japan. Moreover, if America proposed to attack Japan, she must first have some suitable naval bases from which to carry on operations. America has, indeed, Hawaii, Guam, and the Philippines, but there is much room to doubt the value of these islands as naval bases to attack Japan.

"Guam is a land which is highly suitable in some respects for a naval base to carry on naval operations against Japan, but its harbor cannot accommodate a larger squadron than eight or nine large ships, and what makes that island more undesirable is that as the hills surrounding the port are low in height, it is exposed to fire from the sea. The Philippines have many decided advantages over Guam, but they also would not constitute ideal bases, in that the communications with these islands are liable to be attacked by the Japanese Navy. Putting Japan in the place of America, she would not shrink from waging war in the face of these difficulties; but I do not think that America can summon up the courage to disregard these obstacles, and think of sending an expedition to a country so far removed from her as Japan.—*Literary Digest*, Dec. 11, 1920.

PROPOSED JAPANESE SHIP MERGERS INTO TWO GROUPS.—The question of amalgamating the leading steamship companies of Japan is being actively discussed there.

When a representative of *The Nautical Gazette* entered the office of the head of one of the local Japanese steamship lines a few days ago he found this official reading the latest issues received here of the *Kaisho Tsuho*, of Tokyo, and the *Kaidi Kidi*, of Osaka, both well-known marine publications.

The publications, said the Japanese manager, were full of news of the suggested merger and he explained how the proposal had arisen. It originated with S. Wahamiya, Secretary of Marine in the Japanese Government and a man to whose views great weight is attached in Japan.

"When Secretary Wahamiya makes suggestions," said this Japanese official, "it is the duty of the Japanese companies to give them careful consideration. This is being done at the present time, but I do not think that Secretary Wahamiya is now as enthusiastic about the proposal as he was when he made it. He sees now that there are serious difficulties in the way of amalgamation and disproportionate conflicting interests to be reconciled.

"It is, of course, desirable to effect economies and avoid waste and duplication. Mr. Wahamiya, I think, has observed that British shipping companies and other foreign companies have undergone a considerable degree of amalgamation, and no doubt he thinks that some amount of amalgamation would be a good thing for Japanese shipping also. But I am afraid he has approached the matter in rather an academic or theoretical way. So far he has not worked out any definite, concrete plan."

From another well-posted Japanese official it was asserted that if an amalgamation takes place at all it will most probably result in the formation of two distinct groups. One of these would embrace the Nippon Yusen Kaisha of Tokyo and the Kokusai Kisen Kaisha of Kobe, while

the other would consist of the Toyo Kisen Kaisha and the Osaka Shosen Kaisha.

Each group, it will be noted, includes a large passenger line and a line chiefly or wholly engaged in cargo-carrying.

The Nippon and the Osaka companies have important European connections, while the chief run of the Toyo is from Japan to San Francisco and thence down to South America. The Kokusai is a combination of ship-builders and shipowners who, after the armistice, entered into an alliance. There are many fine cargo boats in the Kokusai and they are being extensively employed in carrying bulk cargoes. The big shipping and trading firm of Suzuki & Co. is the Kokusai's New York agent.

There is little doubt in the minds of American steamship men that the American Merchant Marine Act has something to do with the proposed Japanese amalgamations. With the discriminations of the Jones Act looming ahead, coupled with a period of lower freight rates and keener competition, it is believed that the Japanese Government, whose views go a long way, desires the Japanese lines to prepare for a rainy day.

Hitherto there has been a good deal of competition among the Japanese lines themselves, as well as between the latter and such foreign competitors as the Blue Funnel Line, Canadian Pacific Ocean Services, Pacific Mail, and latterly the companies operating Shipping Board tonnage on the Pacific. With the advent of the Shipping Board's passenger liners to the Pacific in the near future to be operated by the Pacific Mail and the Pacific S. S. Co., this competition will be enhanced.

One view put forward here is that if the Japanese find themselves seriously affected by discriminations, they might concentrate on South America rather than on North American connections and strive to take as big a part as possible in foreign trade there.—*The Nautical Gazette*, Nov. 20, 1920.

NOTE.—Subsequent information indicates that this proposed merger has fallen through.

AERONAUTICS

THE USES OF HELIUM.—The production of helium on an extensive scale which began during the war, when it was proposed to use this gas for filling balloons and dirigibles, has led to considerable discussion as to other ways in which helium can be used. Prof. J. C. McLennan deals at length with this question in a lecture, published in *Nature*. It appears, in the first place, that if helium is used for filling airships the supply from the British Empire would be far from adequate for the British Air Fleet. One way of economizing it, would be to use it only in compartments adjacent to the engines. As to various industrial uses, it may be used as a filling for thermionic amplifying valves of the ionization type; also for filling tungsten incandescent lamps, especially for signal purposes where rapid dimming is essential, and for producing gas arc lamps in which tungsten terminals are used. Some objections to these uses are pointed out. Nutting has shown that Geissler tubes filled with helium are very suitable, under certain conditions, for light standards in spectrophotometry. Helium is also invaluable in spectroscopy, and for various other laboratory uses. Elihu Thomson has suggested that if divers were supplied with a mixture of oxygen and helium, the rate of expulsion of carbon dioxide from the lungs might be increased, and thus the period of submergence might be considerably lengthened. The widest application of helium, however, appears to be in the field of low temperature research, as liquid helium—and perhaps eventually solid helium—enables one to reach the lowest temperatures attainable by any means. A point of special importance to which Professor McLennan calls attention is that the supplies of natural gas from which helium can be extracted are being rapidly used up; hence it might be well to store a supply of this gas for use in years to come.—*The Scientific American*, Nov. 13, 1920.

A NATIONAL AVIATION POLICY.—Aviation activities during the war were concentrated on the development and production of military aircraft. The selection of the landing fields that were established was necessarily guided by military considerations. The close of the war found us with an aeronautic industry at the stage of quantity production, a large amount of aircraft material on hand, a large number of trained flyers, and a few scattered landing fields. In brief, all this constituted the national inheritance from the investment of hundreds of millions of dollars for the hurried development of military aviation during the war. In the two years that have elapsed since the armistice a good proportion of the aircraft material has become obsolete. A majority of the technical personnel and trained flyers have returned to civil life and to pursuits not connected with aviation. The great aircraft industry has almost disappeared, and some of the landing fields have been surrendered. Those that have been retained really represent one of the most valuable physical assets salvaged from our aircraft expenditures.

As a nation we must seek to realize clearly the lessons of the war and to profit by them. Our efforts in the development of a military air force and the organization of an aircraft industry during the war were remarkable accomplishments in themselves, but the handicap of a negligible industry at the outbreak of the war and the general lack of technical knowledge were too great to be satisfactorily overcome in a short time, regardless of the money available. It is now our clear duty to take to heart the lessons and mistakes of the war period and to shape a national aviation policy that will be productive of the greatest possible structural development consistent with prudent economy.

The government agencies actively concerned with the use of aviation at the present time are the Army Air Service, the Naval Air Service, and the Postal Air Service. Other agencies such as the Geological Survey, the Coast and Geodetic Survey, the Forest Service, etc., have more or less need for the use of aircraft in their work. The National Advisory Committee for Aeronautics is concerned not so much with the promotion of the uses of aviation as with the scientific study of the problems involved and the technical development of the art for the benefit of governmental agencies and of the public generally, but the committee believes that the use of aircraft by the various governmental agencies should be encouraged where its efficient use is practicable; also that the general development of aviation for all purposes should be encouraged by the national government. The faithful performance of our national duties in these respects becomes compelling from considerations of wise military preparedness.

In time of war aviation will probably be the first arm of offense and defence to come into action. For this there must be an established industry and a trained and active air service. Aerial supremacy at the outset of hostilities would be a tremendous military advantage. Ultimate victory would unquestionably incline to the side that could establish and maintain supremacy in the air. Huge expenditures of money in time of danger and frantic efforts to train personnel and to develop hastily an aircraft industry from almost nothing will not do. There must be wise preparedness; there must be in healthy existence at least a nucleus of an industry capable of adequate expansion; there must exist civil and commercial aeronautical activities in all parts of the country which would be the main support of the industry in time of peace. In pure self-defence the government must encourage the development of commercial aviation. The alternative proposition is the creation and maintenance of a powerful standing military air service relatively self-reliant in time of war. We cannot, however, afford the expense which such a policy would entail, and there would be no advantage in time of peace from such expenditures comparable in any way to the advantages to be gained from the support of civil aviation. We should maintain an active air service in time of peace, which should possess inherent strength and be something more than a mere nucleus for expansion in time of war. In the final analysis, however, we must depend

upon civil aviation to furnish a military reserve force. The remarkable accomplishments of our Motor Transport Service during the war were only made possible by the healthy condition of our automobile industry. The problem is to place our aircraft industry in a healthy condition, and to do this we must enter without delay upon a sane, sound policy for the development of civil aviation. The relative cost of fostering an organized plan to develop commercial aviation would be much less than the waste that would inevitably result from unprepared entry into war. Aside from military considerations, the fostering of commercial aviation would in time yield adequate returns in itself in the form of promoting and strengthening our means of transportation, advancing the progress of civilization, and increasing the national wealth.

Aviation is a distinct advance in civilization given to the world by America. The importance of the development of aviation from a military standpoint was not fully appreciated before the war, with the consequent lack of encouragement of the development of the art. The handicap of years of comparative inactivity has not yet been overcome. We cannot afford to repeat the mistakes of the past. We cannot go backward, but must go forward with the intelligent development of aviation in all its branches.

Aviation is still in its infancy; its possibilities, while unknown, appeal to the imagination. The forced development during the war and some of the experimental development since have not been based upon scientific research and sound scientific principles that make for substantial progress. Technical training is necessary, including education in advanced aeronautical engineering, so is the actual training of a large body of men in the technique of the care and operation of aircraft. Broadly speaking, scientific research, technical training, and commercial aviation constitute, or should constitute, the backbone of a national policy.

Reducing to definite form the steps which in the opinion of the National Advisory Committee for Aeronautics are wise and timely, the committee, after careful consideration of all the facts within its knowledge, submits the following specific recommendations:

First. That legislation be enacted providing for federal regulation of commercial air navigation, licensing of pilots, aircraft, landing fields, etc. At the present time there is no authority of law for any executive agency of the government to perform such duties. The committee believes that for the executive administration of these new duties of government there should be established in the Department of Commerce a bureau of aeronautics in charge of a commissioner of air navigation, who should also become a member of the National Advisory Committee for Aeronautics. Acting in cooperation with the War, Navy, and Post Office Departments, the committee has prepared a draft of legislation which appears in full in a preceding section of this report under the heading "Organization of Governmental Activities in Aeronautics," and which it strongly recommends for the immediate consideration of Congress. In this connection the committee recommends also the adoption of a policy of federal aid to the states in the establishment of landing fields for general use in every state in the union.

Second. That the Congress authorize an American airplane competition in order to stimulate private endeavor in the development of new and improved designs of aircraft, the competition to be under the direction of the National Advisory Committee for Aeronautics, the entries of the successful competitors to be purchased by the government at a predetermined and announced figure and made available for the use of the Postal Air Service.

Third. That adequate appropriations be made for the military and naval air services in order to permit the continuous development of these exceedingly important arms of the two services, and to enable them to place orders in such a way as to maintain a nucleus of an aircraft industry capable of

sufficient expansion to meet military needs in time of emergency. The committee considers this absolutely essential.

Fourth. That the control of naval activities in aeronautics be centralized under a naval bureau of aeronautics in charge of a director of naval aviation. At the present time responsibility for the development of naval aviation is divided between the Office of Operations and the numerous bureaus of the Navy Department. This basis of organization does not permit full cooperation with the Army Air Service or with other governmental and civil agencies, nor does it, in the opinion of the committee, promote the efficient development of aviation within the navy.

Fifth. That the Air Mail Service of the Post Office Department be further extended and developed. This service has given the best demonstration of the practicability of the use of aircraft for civil purposes. It has been seriously handicapped by inability to secure suitable airplanes adapted to its work. The question is one of design, which should be handled by the industry. The remedy lies in the development of the industry, which can only be brought about at an early date by the indorsement and prosecution by the government of a constructive, comprehensive policy.

Sixth. That the Congress approve the program of scientific research in aeronautics formulated by the committee and provide for the enlarged facilities necessary for its prosecution. Continuous scientific research is necessary for the real advancement of the science of aeronautics. The number and importance of problems requiring solution have increased greatly with the general development of aircraft, and the development of airplanes of all-metal construction will require a large increase in the aerodynamic research and engineering experimentation conducted by the committee at the Langley Memorial Aeronautical Laboratory at Langley Field, Va.—*Annual Report—National Advisory Committee for Aeronautics*, 1920.

MARTIN TORPEDO PLANES ARRIVE AT NORTH ISLAND.—Four Martin bombing planes have arrived at North Island Station from Cleveland, Ohio, and will soon be seen in the air here.

These new monsters of the air will have a wing spread of 71 feet 5 inches, the fuselage measures 45 feet 8 inches and the machine is 15 feet 5 inches in height. These monster bombing planes will weigh 6742 pounds when completed and will have a total gross life of 11,909 pounds, which includes the torpedo that she will carry, which will be an 18-inch mark 7 model 5 and will have the total weight of 1650 pounds, plus the 4501 pounds of bombs and two machine guns of the Lewis type one in the forward cockpit and one in the after cockpit; the latter will be manned by the mechanic, who will evidently have his hands full all the time handling the motors of so vast a plane and also a machine gun.

The interesting features of these planes lie in the fact that they are so vast in dimensions and are still capable of making approximately 100 miles per hour, and are to be driven through the air at that terrific speed by two 400-horsepower high compression Liberty motors.

Ensign E. E. Reeder has been appointed pilot of the first Martin bomber to be actually put in service on this coast. His vast experience in the air has made this step possible, and his persistence has been rewarded by getting the honor of being the first naval officer to pilot this type of plane.—*The Aerial Age Weekly*, Nov. 15, 1920.

ENGINEERING

ELECTRIC WELDING OF STRUCTURAL STEEL.—An article discussing the practical details in the electric welding of structural steel.

Building departments have fought shy of structural welded joints, as they did not feel sure of them. It is, however, possible to make a welded joint more definite and independent of the worker than is possible with reinforced concrete. There are four main factors in the quality of a weld: (1) The design of the joint, (2) the size of the electrode, (3) the value of the current, (4) the skill of the welder. The fourth factor can be reduced to a minimum by proper choice of the first three, and if the first three are satisfactory a failure in the fourth can be easily detected by superficial inspection by one experienced in the art of welding. The writer deals fully with design of joints and the making of the three types of joints involved, namely, fillet weld, butt weld, and rivet weld. The size of the electrode is governed mainly by the design of the joint: the effect of size is discussed. The value of the current depends on the electrode used and on the welder, and is practically limited by the skill of the latter. His skill involves choice of joint, electrode size and current, as well as actual manipulation. The two factors can be determined independently of him and in some cases by using special equipment, current and length of arc can be independent of him also. *Iron Age*, June 17, 1920.—*The Technical Review*, Nov. 2, 1920.

PULVERIZED PEAT-FIRED LOCOMOTIVES.—Some Swedish engines have been fitted with burners to accommodate pulverized peat, and the results of tests are now available.

In addition to the burning of peat, the firebox is arranged with a small grate for coal, which is hand-fired. The coal burnt is about 3 or 4 per cent of the peat, by weight, and it acts as an igniter for the incoming mixture of peat and air. The peat is dried to 12 to 16 per cent moisture and powdered to pass through a screen having 100 meshes per sq. cm., two tons of fuel being obtained from 3 tons of air dried turf. This fuel has been analysed, and from comparative tests made on the line it is shown that the peat fired locomotive has an overall boiler efficiency of 73 per cent with a firebox temperature of 1670° F. against 65 per cent and 1510° F. for hand coal-fired engines. Four thousand kg. of peat will haul a freight train of 650 tons for 100 km. or a passenger train of 300 tons for 130 km. at given speeds.

It is claimed that this system is simple, that coal-fired engines can be converted to peat firing with a minimum of trouble and expense, and that the fitting of such engines enables local fuels to replace imported coal. (*Railway Engineer*, July, 1920.)—*The Technical Review*, Nov. 16, 1920.

APPARATUS FOR ELIMINATING SMOKE FROM STEAMERS.—Describes an arrangement designed in Italy which has met with the approval of civilian and official expert authorities and which avoids the disadvantages attached to apparatus adopted during the war, where the smoke was ejected from the sides of the vessel causing the cabins, etc., aft to be in a filthy condition and leaving a heavy continuous cloud of smoke on the surface of the water which would still serve as a guide to submarines.

The new arrangement consists in the utilization of the circulating water of the condensers in a special apparatus for reducing the temperature of the smoke as it comes from the boilers and clearing it of all matter in suspension. The cooled gases can be discharged either above deck or outboard above the water-line. The advantage of this arrangement for warships are obvious, allowing of clear decks and, in the case of large submarines, of high speeds demanding the use of steam engines and boilers, the present serious inconvenience experienced of chimneys becoming distorted when immersing, rendering perfect closing of openings in the deck impossible, would be avoided. (*L'Industria*, July 15, 1920.)—*The Technical Review*, Nov. 9, 1920.

REMARKABLE DROP IN OUTPUT OF CENTRIFUGAL PUMPS AFTER STARTING.—Observations made by the author indicate that many centrifugal pumps show a gradual falling off in efficiency after running for some time. Two characteristic cases are cited in connection with the large pumps used for pumping the Haarlem mere. In the first the output fell to 30 per cent below the normal, and in the second case a marked increase in the energy consumption was noticeable shortly after the pump was started. On stopping and starting the pump, the normal output and energy consumption were again obtained; but the conditions gradually fell back to those previously discovered. After discussing the influence of a possible accumulation of gas (from a peaty soil) in the suction pipe, the author rejects this explanation as being insufficient. He ascribes the cause to the fact that turbine pumps of the Francis type are designed on the assumption that the inflowing water is moving in an axial and not a rotary direction. This assumption is undoubtedly correct during starting, but it can be readily demonstrated that very little would be required to impart a rotary movement to the incoming water column, *i. e.*, the mass of water would move in a spiral through the pipe. This rotary effect would explain the phenomenon and also the fact that in turbine pumps with a high circumferential speed, and where little or no rotary motion would be imparted to the incoming column of water, this falling-off in output disappears. The author is of opinion that the transmission of this rotary motion from the rotor of the pump back along the incoming water column is considerably accelerated by the presence of large quantities of suspended matter in the water. The obvious solution of the difficulty for low-speed turbine pumps would be the introduction of a rib or ribs in the suction pipe, to prevent a rotary motion from being imparted to the incoming water column. (*De Ingenieur.*)—*Journal of Am. Soc. M. E.*, Dec., 1920.

THE NAVAL EXPERIMENTAL LABORATORY.—The new naval laboratory for which Congress has appropriated \$2,000,000, owes its inception to the Naval Consulting Board. It will be remembered that one of the first recommendations of this body was the building of a large and thoroughly equipped laboratory in which promising inventions could be investigated and rejected or developed, as the case might be, on a scale and with a completeness which existing conditions in the Navy Department rendered impossible. In furtherance of this scheme a committee of the board, composed of men who were expert in laboratory work, was appointed to formulate a general plan and select a site. For various reasons, they reported to the board in favor of Annapolis; but in the discussion which followed some diversity of opinion developed, notably in the case of Mr. Edison, who was strongly in favor of New York.

This took place after 1914 and before our entrance into the European war. The rush of our preparation for that great conflict and the multiplicity of larger problems that developed, coupled with the fact that there was an offer to the government of many private and well-appointed laboratories, caused the subject to be dropped for the time being. It should be mentioned, however, that the choice of Annapolis was favored by naval officers, who pointed out that the government had already established an experimental laboratory at that location, which had cost about \$600,000, and that there was ample land for expansion of the plant. Also it was urged very strongly that the work of the laboratory be coordinated with that of the Naval Academy, and particularly with the work of the post-graduate school, which, by the way, has been opened up again since the war, and is to be greatly expanded. The point was made that an adequate experimental and research laboratory at the naval college would enable the student officers to do special research work, and that the experts of the laboratory might be employed as lecturers at the postgraduate school. In the minds of many naval officers this was the strongest of all considerations.

However, the laboratory committee, after giving due weight to the opinion of naval officers, has finally decided against Annapolis, and in favor of a site at Bellevue, a naval reservation near Glesboro Point on the Potomac and lying in the District of Columbia. The site is opposite and about one mile distant from the War College at Washington.

The principal considerations which led to the choice of the Washington site are first, the desirability of locating the laboratory as near as possible to the Bureau of Standards, with which institution the work of the laboratory must necessarily be carried on in close and continual coöperation. Secondly, it was considered desirable that the laboratory should be built within easy reach of the various naval bureaus, particularly those of Construction and Repair, Steam Engineering and Ordnance. Another consideration was that of assuring the future finances of the institution, which would have to come in the form of appropriations from Congress. Laboratory work and plant is frequently difficult to explain to the lay mind. If the laboratory were located within half an hour's automobile ride from the Capitol, it would be possible to take the committee down and show them work which was being done and explain on the spot why the requisite appropriations were necessary. A final reason and alas, perhaps the most important of all, was that by locating the laboratory in the District of Columbia, whose residents have no vote, it would insure that the financial prosperity of the institution would not depend upon those familiar tactics known under the name of "log-rolling." If Congressmen had no particular political object to further by giving or withholding appropriations, it was realized that the prospects of the claims of the laboratory obtaining just and unbiased consideration would be greatly enhanced.—*The Scientific American*, Nov. 13, 1920.

SOMETHING NEW IN ARC LAMPS.—About two years ago we had something to say regarding a novel form of enclosed arc employing tungsten electrodes and enclosed in a high vacuum, developed in England. At that time the inference was that the lamp was of a purely experimental nature, but we learn of late that this arc lamp is a commercial success. Briefly, the lamp resembles a round incandescent lamp so far as exterior design is concerned. Instead of the usual filament, however, the lamp contains a small ball of tungsten, a horizontal tungsten rod, and a small tungsten coil right over the tungsten ball. To start the arc the vacuum must first be bridged, since the electrodes are fixed. This is accomplished by passing a current through the tungsten filament which becomes incandescent and heats the surrounding vacuum. Then the current is switched over to the gap between the horizontal tungsten rod and the tungsten ball. The heated vacuum, no longer being an insulator, carries over the 110-volt current and the tungsten ball is heated to incandescence by the arc. The result is an extremely concentrated source of high candle power, suitable for numerous purposes. At present M. Belin, the inventor of the system for transmitting photographs over telegraph and telephone lines, is using such a lamp for the source of light in his receiving set. The details of M. Belin's apparatus appeared in our November 6 issue.—*The Scientific American*, Nov. 20, 1920.

THE PRESENT POSITION OF THE MARINE DIESEL ENGINE.—As a result of the war, considerable gaps are to be found in the technical progress of many peaceful pursuits, and in those cases that apply to British marine engineering, these must be bridged if our position is to be fully maintained. In this country, during the years 1914 to 1918, considerations in connection with the development and applications of the Diesel engine for mercantile purposes were almost completely shelved. The exigencies of this period of stress and danger necessitated concentration on that type of machinery—the triple-expansion steam engine—most capable of being easily and rapidly produced by those manufacturing plants less suited to the duty of meeting the requirements of the fighting forces.

In reopening the subject of the marine Diesel engine, after its absence from the proceedings of the institution for six years, I propose to confine my remarks solely to the broader issues, in view of the fact that at the moment so many shipowners, shipbuilders, and engineers are considering this new prime-mover chiefly in its general aspects.

Conditions operating at present, resulting in large measure from the war, make most potent the claims advanced in favor of the principle of internal combustion. Quite suddenly and recently for the mercantile marine, fuel oil has been very widely recognized as the most suitable combustible. Not the least compelling factors towards this marked preference have been the labor and wages movements ashore and afloat. Some fears are entertained regarding supply and distribution of liquid fuel, but with transporting tonnage increasing and the likely early development of petrol substitutes, supply should continue to equal demand. Whether grounds may be found upon which to base such fears, all must be agreed as to the fundamental necessity of conserving available supplies by the exercise of the maximum economy. The effect of the operation during the war of strict discipline in national interests has rendered easier the acceptance of the doctrines of economy whatever the direction in which they are urged, and has made even the most retrogressive of men receptive of suggestions to this end.

Many engineers have now become familiar with the leading principles of internal combustion, and more Diesel work has been undertaken at home within the last few years, due to submarine naval requirements, than in any previous period. Many of the salient points are now appreciated, and growing interest is stimulated and met by the technical literature increasingly available.

Recent experience with the most modern and economical steam installations applicable to merchantmen of average speed—the steam turbine and double-reduction gearing—has demonstrated clearly that the step from single to double reduction is not one of mere multiplication. New factors have been introduced and different values must be given to the various forces in operation. A complete solution, whether dependent upon a combination of all or principally upon a few of the many variables will no doubt early be found. The large number of factors entering into this question is sufficient alone to suggest its nature. The most important of these are lubrication, alignment of shaft, coincidence of helical angles, material and design of inter-meshing teeth, pressure and rubbing velocity between teeth, torsional vibrations, all of which play their parts. The present position, however, is such as to give to the Diesel engine a greater prominence than it might otherwise have achieved, in spite of the somewhat retrograde step from purely rotary to reciprocating motion.

The past record of the oil engine at sea shows in a striking manner the relative success of the four-cycle principle applied to single-acting engines. Ships fitted with two-cycle engines are in mostly isolated cases. Four-cycle engined ships are generally more than usually interesting units of fleets of considerable size and importance, of one type of four-cycle slow-running engine alone 122,000 indicated horsepower are at sea.

Experience during the war with submarines also showed the four-cycle engine in favorable light.

Where reduction of weight, compactness, maximum power per unit volume of ship occupied by internal-combustion machinery were the chief considerations, the four-cycle principle was found fully to meet the requirements. In Germany the two-cycle engine was most favored for marine work prior to 1914, but for submarine propulsion during the war this system was gradually dropped. Ultimately, by far the largest number of German submarines and all having the highest power per unit had four-cycle engines. In our own navy the four-cycle principle was almost exclusively adhered to.

The present position reflects clearly the finding of past performance and an analysis of the marine Diesel machinery under construction in all engineering countries is given here.

The figures are based on the published particulars of 184 ships and their machinery.

(1) The total tonnage expressed as deadweight capacity is:

One million two hundred and sixty-three thousand tons, divided as follows:

Two-cycle = 208,000	{ Single screw, 64,000 tons deadweight. Twin screw, 144,000 tons deadweight.
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Four-cycle = 1,055,000	{ Twin screw, 1,005,000 tons deadweight. Single screw, 50,000 tons deadweight.
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(2) The total brake horse-power is 405,000, of which 326,500 is four-cycle, and 78,500 two-cycle. The indicated horsepower is in approximately the same ratio.

(3) Of the 325 engines comprised in the above totals, 275 are four-cycle, and 50 are two-cycle.

(4) The average brake horse-power per engine is 1240, the four-cycle being 1190, and the two-cycle 1570. The average brake horsepower per cylinder is 210; in the case of the four-cycle 194, and the two-cycle 309.

Eighty-four per cent of the ships are twin screws and over 80 per cent of the total number of marine engines and horsepower is of the four-stroke cycle type. In Britain the two-cycle is more favored than elsewhere.

The most important of the problems of design are common to both two- and four-cycle engines and the first concerns the injection of the fuel into the working cylinder. The exact quantity of fuel, at a pressure sufficient to ensure injection, must be measured out by the pump and spread in some 30 degrees of revolution as widely as possible into the combustion space, in a sufficiently finely divided state to ensure rapid ignition and satisfactory combustion chiefly in this direction of improving distribution of the fuel in the combustion chamber can increased economy be sought.

There are two alternative methods of spraying; one by means of compressed air, the other by injecting the fuel at a high pressure known as the solid injection system. The utilization of compressed air is most general. So far as marine installations are concerned, the principal advantage of the solid-injection method, where compressed air is not used to assist injection, is, that the air-compressing machinery required for supplying maneuvering power, is not a part of the main propelling engine, and does not require to run continuously at sea. Moreover, the air-compressing plant, where solid injection is adopted, can be reduced by from 40 to 50 per cent in capacity.

Reliability with air-compressors delivering at 850 to 1000 lbs. per sq. inch has now reached a high level, the leading factors towards this end being generally appreciated, and air-compressor problems rated at their full value. Multistaging is essential, and compression to 1000 lbs. per sq. inch should be carried out in not less than three stages, so proportioned that no undue ratio of compression and consequent temperature can occur in any stage. Particularly should the l. p. compression be minimized. Such rises of temperature as are inevitable with compression should be reduced by efficient cooling of the air during compression and by the installation of intercoolers and aftercoolers to reduce to atmospheric whatever temperature remains after compression. Removal of moisture from the air should be facilitated. Every effort in design should be made to ensure that the compressor valves and springs can be easily removed and replaced.

It is not to be inferred in any way that finality has been reached in compressor design or in methods of injection. In regard to the former a better method for removing oil and moisture from the air is required, and in respect of injection a suitable valve should be produced which, whilst requiring compressed-air spray for full power and maximum efficiency, can still operate satisfactorily at reduced power without the medium or assistance of compressed air.

The other fundamental or injection, the measuring of the oil fuel, involves the most delicate apparatus associated with the Diesel oil engine the fuel injection pumps and controlling gear. The system of having one pump per cylinder is now almost universal for marine work (excepting where solid injection is used), and only in this way can the maximum security against a large percentage of overcharge and overload in one or more of the cylinders be obtained. These individual pumps, therefore, become of relatively small size. Even with separate pumps, continual care and intelligent supervision must be exercised to ensure that the deliveries from the pumps are maintained equal, lest one or more cylinders should be overloaded to counteract the effect of diminished deliveries from defectively working pumps. Means are now generally provided whereby any pump can be cut out and overhauled whilst the remainder are in operation.

The Diesel engine remains a heavy and expensive prime-mover in comparison with its steam rivals. Even with the progress made in design within the last six years, it can be definitely stated that there has been generally an increase in the weight and the space occupied by the slow-speed Diesel engine per horsepower developed continuously. The factors opposed to a reduction of these disabilities and rendering difficult the path towards the higher powers now desired, are the temperature gradient through the metal surrounding the combustion chamber and the fact that the major portion of the material of the engine is only utilized for a small fraction of the running time. The former refers particularly to the two-cycle, and the latter to the four-cycle engine, where three quarters of the running time is idle so far as power output is concerned. Moreover, of the one-power stroke per two revolution, only one-half or 12.5 per cent of the cycle stresses the parts of the engine comparably with their strength and scantlings.

The unique economies possible by the adoption of the principle of internal-combustion are only gained at the expense of foregoing all the many advantages derived from using the most flexible known power conveying medium, steam.

To appreciate the type of stressing to which the main parts of a Diesel engine are subject, comparison may be made with a steam engine of normal design and of equal power output. The maximum normal load with the oil engine is more than five times as great, and, furthermore, the rate of application of this main load is increased ten times.* With internal-combustion the normal stresses are liable to sudden increases calling for a larger factor of safety, and design questions relating to the main parts of the engine must be considered strictly in this light.

In regard to the temperature gradient and the stresses so incurred, data are lacking; but, so far as they are available, they go definitely to prove that the four-stroke cycle engine has distinct advantages. The temperature gradient through the metal of a four-cylinder liner and through the furnace of a cylindrical marine boiler are substantially equal. In the former the stressing is intermittent, and in the latter relatively steady. The stresses consequent upon this temperature gradient are half as high again in the case of the boiler furnace, due to the higher co-efficient of expansion and modulus of elasticity of steel as compared with cast iron. With the cylinder liner the transmission of heat is a subsidiary function to the more important duties of guiding the power piston and maintaining a suitable surface to permit of piston-ring gas tightness with minimum friction. The simple liner form of construction adopted up to the present with all but a few exceptions, cannot be approved on theoretical grounds. To obtain a minimum value for the combined stress consequent upon temperature gradient through the metal and internal pressure, a ribbed and

* Proc. of the Junior Institution of Engineers, May, 1914. "High Power Diesel Engines; Their development for Marine Service."

TABLE I.
COMPARISON OF RUNNING COSTS OF DIESEL SHIPS AND STEAM SHIPS.

	1,000 Brake horse-power				2,400 Brake horse-power			
	Single-screw, Diesel, 1,000 B.H.P.		Single-screw, double-reduction geared, 1,000 S. H. P.		Twin-screw, Diesel, 2,400 B.H.P.		Single-screw, double-reduction geared, 2,400 S.H.P.	
	Coal	Oil	Coal	Oil	Coal	Oil	Coal	Oil
Fuel, lbs. per H.P. per hour.....	45	1.1	1.5	1.4	45	1.4	1.5	1.1
Consumption, tons per day.....	4.82	11.8	16 1	18	11.6	18	38.6	28.3
Consumption, tons per 30 days...	145	354	483	540	348	540	1,158	840
Price of fuel per ton.....	£11	£10	£5	£10	£11	£10	£5	£10
Cost of fuel per 30 days.....	£1,595	£3,540	£2,415	£3,750	£3,828	£3,828	£5,790	£8,490
Lubricating oil consumption, gallons per day.	10	2	2	3	21	3	5	5
Lubricating oil, cost per gallon..	5/-	5/-	5/-	5/-	5/-	5/-	5/-	5/-
Lubricating oil, cost per 30 days..	£75	£15	£15	£22 10	£157 10	£22 10	£37 10	£22 10
PERSONNEL—								
Chief Engineer.....	1	1	1	1	1	1	1	1
Assistant Engineers.....	3	2	2	2	6	3	3	3
Greasers.....	3	3	3	3	3	3	3	3
Firemen.....	—	3	3	3	—	3	9	6
Trimmers.....	—	3	3	—	—	—	4	—
Donkeyman.....	1	1	1	1	1	1	1	1
Electrician.....	1	—	—	—	1	—	—	—
Total engine-room staff.....	9	10	13	10	12	12	21	14
Total wages, 30 days.....	£191	£195	£224 10	£195	£252 10	£252 10	£380 10	£265
Total upkeep per 30 days, at 7/- per day.	£94 10	£105	£136 10	£105	£126	£126	£220 10	£147
Total wages, fuel, oil, and upkeep for 30 days.	£1,955 10	£3,855	£2,791	£4,135 10	£4,364	£4,364	£8,513 10	£11,699 10
Ratio.....	1	1.97	1.44	2.12	1	1	1.95	2.68
Net saving per annum of 200 days sailing, Diesel over steam.	—	£12,650	£5,570	£14,520	—	—	£27,645	£48,850

NOTE.—In addition to the above, the following savings are effected. Fueling costs, less demurrage, additional cargo capacity, less accommodation for engine-room staff, no stand-by losses, less cleaning ship, higher average speed in a sea-way, reduced fueling appliances required, etc.

built-up form of construction must be adopted. This can very simply be accomplished, as is sometimes the case, with the four-cycle engine, but imposes greater difficulties in the case of the two-cycle, where exhaust and scavenging ports have to be accommodated in the cylinder. Computation of the high stresses with the two-cycle cylinder in way of the scavenging air-inlet and main-exhaust ports is extremely difficult. These are bound to be very considerable in view of the high velocity of the exhaust gases and the consequent high rate of heat transmission from these gases to the walls, and are further intensified by the cooling and distorting effect of the entering scavenging air with the normal two-cycle design.

Better Utilization of Materials.—For a better utilization of materials than is achieved with the four-cycle engine, the two-cycle single-acting, the four-cycle double-acting, the opposed pistons construction, and the two-cycle double-acting principles, or the combined effect of oil and steam as with the "Still" engine are put forward. However attractive may be the mechanical arrangements so facilitated, the Diesel oil-engine is a complicated machine highly loaded and stressed by high-pressure combustion within the cylinder, and short-cuts to achieve reduction in space, weight, and cost, will only be fruitful in so far as first principles and fundamentals, more especially in respect of rate of heat transmissions, are not violated.

TABLE II

COST OF FUEL OIL AND COAL AT PRINCIPAL PORTS, JULY, 1920

Port	Fuel oil per ton	Coal per ton	Port	Fuel oil per ton	Coal per ton
Alexandria ..	250/-	186 to 200/-	Karachi.....	150/-	45/-
Adelaide....	180/-	40/-	London.....	250/-	115/-Welsh.
Batavia.....	150/-	127/-	Liverpool....	250/-	115/-Welsh.
Bombay.....	150/-	45/-	Lisbon.....	250/-	160/-
Buenos Aires.	265/-	170/-	Madras.....	150/-	45/-
California ...	62/- to 92/-	69/-	Melbourne...	180/-	35/-
Christiania...	224/-	210/-	New Orleans.	58/2	40/- to 69/-
Calcutta	250/-	25/-	New York....	47/6	55/- to 68/-
Cape Town...	220/-	46/9 Trans-vaal.	Palembang...	125/-	127/-
Colombo.....	159/-	102/6	Pensacola....	80/-	42/-
Curacao	80/-	125/-	Port Said....	250/-	186/6
Glasgow.....	250/-	115/-Welsh.	Panama.....	75/-	125/-
Hong Hong...	150/-	115/-Welsh.	Rotterdam...	220/-	160/-
Havana.....	142/6	125/-	Riode Janeiro.	250/-	185/-
			St. Thomas...	160/-	124/-
			Sydney	175/-	21/3

Average price per ton: — Coal = 104/-; Fuel Oil = 191/-.

The foregoing conditions of design of the Diesel engine prevent it being a cheap and light prime-mover. Increased experience, better materials, more efficient utilization of such masses as are required to cope with the pressures of the cycle, with standardization, will, in due course, effect a reduction in these disabilities.

At present the cost can be stated to be from 25 to 33 per cent more than for a steam plant, depending in the type of auxiliaries applied to the oil-engined ship, and when comparison is made with steam-reciprocating or double-reduction turbine steam machinery. This higher cost of machinery is minimized in effect by the greater cargo-carrying capacity some-

times possible by the adoption of oil engines, or alternatively by the fact that a smaller Diesel-engined ship serves to give equal earning capacity with a steamer. The economy of operation possible with the oil engine is such that, granted reliable performance, the extra first cost is speedily balanced by the increased profits obtainable. Table I indicates in two cases the nature of the comparison. The total saving for 200 days' sailing per annum by installing Diesel instead of steam machinery is given for wages and upkeep, fuel, and oil costs, in the case of a single-screw ship of 1000 b. h. p. and also of a ship of 2400 b. h. p.; twin screw in the case of Diesel engines and single screw in the case of steam. No estimation has been made regarding the other savings generally possible, the most important of which is additional cargo capacity, no stand-by losses, and higher average speed, more particularly when the oil is compared with the coal-fired ships. The figures, however, for the savings in fuel, lubricating oil, wages, and upkeep are, it will be admitted sufficiently attractive to merit close attention by shipowners to the Diesel system of propulsion, when full comparisons can readily be made to meet the specific case of any particular type of ship or trade.

The prices of oil fuel and coal at various ports given in Table II may be referred to.

That after ten years of experience, keeping in view the last five years of intensive service, reliability can be obtained with the Diesel engine will not be gainsaid. The position of this new prime-mover is not yet, however, sufficiently secure for short-cuts towards the lightening or cheapening of the engine to be undertaken without the most careful consideration. The available knowledge demands that oil engines shall be rated at a moderate power-output per unit of swept cylinder volume with the consequent low-temperature gradient through, and stresses in the metal exposed to combustion temperature. Ample strength and rigidity must be given to those parts that are stressed by the pressure of the cycle, and a high quality of workmanship is essential for all the principal units. So long as labor conditions do not very appreciably change, the Diesel oil-engine will increase rapidly in importance, with the full realization of the enormous advantages of liquid fuel as a marine combustible. Satisfactory distribution of fuel throughout the world seem assured and any future shortage will first affect those plants less able to compete in regard to economy of consumption of liquid fuel. Powers up to 6000 or even 8000 b. h. p. per ship with twin screws (500 b. h. p. per cylinder) can be looked for in the near future, and gradual increases will take place successfully by short steps, consolidating each advance as gained, before proceeding to the attainment of higher outputs.

Larger Variety of Types.—Under the entirely new conditions now operating it is pleasing to reflect that at home there are under construction a larger variety of types of marine oil engines than in any other country, indicating an enterprising and progressive policy of determined trial. This is in strong contrast to the apathy with which we were charged before the war. Experience in due course with these engines will go far to enable relative values to be given to various systems and types of construction. A few may be eliminated, as has been the case with other prime-movers, but the majority will remain until gradual development and increased application enables a higher plane of performance to be reached when the issue will become narrowed down.

In the future the claims of the Diesel-electric system of propulsion will receive much more attention than hitherto, and this may prove the most secure path towards high power. Whatever the merits of steam-electric marine installations, the case for the Diesel-electric, so far as the mercantile marine is concerned, is much stronger.

The longed-for internal-combustion turbine does not yet appear on the horizon.—*Engineering and Industrial Management*, Oct. 28, 1920.

NAVIGATION AND RADIO

PITOT-LOG FOR STEAMERS.—The firm, Siemens & Schuckert, have designed a new speed indicating apparatus which according to claims made indicates the velocity of vessels not exceeding a speed of 26 knots with an error of 1 per cent.

The instrument measures the difference between the static pressure of a column of water above the measuring point, and the dynamic pressure, near the stem of the ship in an L-shaped Pitot tube, of which the long leg is vertical, the short leg parallel to the axis of the ship, with the free end pointing forwards and fitted with a nozzle communicating with the sea. It is important that the nozzle is placed in a position where it is not obstructed by projections on the hull or by discharge pipes from the ship, and that it is sufficiently removed from the stem to be outside the eddies round same. At a speed of 12 knots a distance of 10 inches is sufficient.

The short leg of the L-tube contains an inner tube through which the dynamic pressure acts, the outer tube being exposed to the static head. The difference is indicated on a special pressure gauge graduated to show the speed. The actual indication takes place close to the nozzle below water level, but can be recorded in any part of the ship, as, for instance, at the bridge. The apparatus is also supplied with a counter that shows the total distance travelled, the hand of the pressure gauge showing the actual speed at any given moment.

This form of log was adopted in the German Navy during the war, and gave complete satisfaction, (*Hansa*, July 24, 1920.)—*The Technical Review*, Nov. 2, 1920.

RADIO EQUIPMENT OF THE "VATERLAND."—On this ship recently recommissioned, there are three complete wireless transmitters, one of which is worked in connection with a high-frequency generator, this being the first instance of the use of such a generator on board ship, according to *Wireless World*. For transmitting on waves of 600 to 1800 meters, and for use with the high-frequency generator, an aerial 190 meters long is carried. For shorter wave lengths and for emergency transmitting two other aerials are provided, each consisting of a single wire spread between the funnels.—*The Scientific American*, Nov. 20, 1920.

ORDNANCE

MUZZLE BRAKES FOR GUNS.—Tests on several types of muzzle brakes or gas deflectors have been made by the U. S. military authorities.

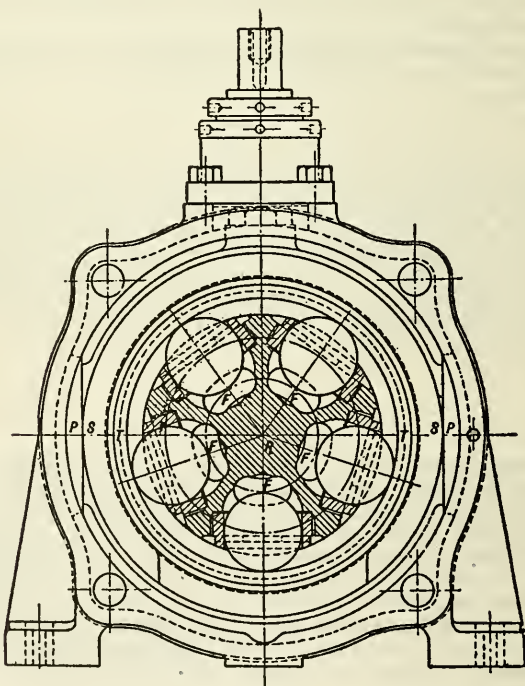
The devices tested were in each case a series of discs or vanes of varying shapes attached to the muzzle of the gun. Against these vanes a certain proportion of the powder gases impinged on leaving the muzzle, the effect of which was to reduce both the length of recoil and the carriage stresses. The tests were confined to 2.95-inch and 3-inch guns, but further tests are to be made with larger caliber guns. The greatest absorption of recoil-energy was obtained in the case of the 3-inch guns, amounting to 80 per cent.—(*Military Engineer*, Sept.-Oct., 1920.)—*The Technical Review*, Nov. 2, 1920.

CHRISTIE MOUNT FOR 155 MM. GUN.—The design of the Christie self-propelled mount for 155 mm. gun (model 1918) of the U. S. Army, embodies several new features in this class of artillery.

The vehicle is designed to travel on rubber-tired wheels on good roads and is convertible into a track-laying vehicle as required. When traveling on wheels the caterpillar track is carried on the vehicle, being so arranged as to be easily dismounted and wrapped on the rubber-tired wheels. There are eight rubber-tired wheels, the two at the breech end of the mount arranged for steering and the two at the opposite end being geared to the transmission; the intermediate wheels are spring mounted in such a manner as to carry weight or not, as desired. The complete unit weighs 44,000 pounds, and is capable of a speed of 15 miles per hour on the rubber tires. The speed as a caterpillar is practically the same, except that the steering compels slowing down. The mount can be run in either direction, but normally travels breech first.

The firing tests have proved satisfactory, and it is stated that the U. S. Ordnance Department are ordering three more mounts of this type in order to conduct service tests.—(*Military Engineer*, Sept.-Oct., 1920.)—*The Technical Review*, Nov. 2, 1920.

LIQUID VARIABLE-SPEED TRANSMISSION GEAR.—*Carey Oil Transmission System*.—Description of the pump used for an oil transmission system.



CROSS-SECTION OF ROTOR OF THE CAREY PUMP.

The rotor consists of a solid block of steel *R* in which five recesses are formed to act as cylinders. Each recess is fitted with a glass-hard steel

bush in which works an ordinary steel ball acting as a piston and having a total clearance of about one one-thousandth of an inch. These ball pistons were in conjunction with a track *T* of glass-hard steel, the track being carried by a cast-steel ring *S* which works between guides *P* formed in the cast-iron main casing or pump body. This ring may be moved to different positions in a vertical direction between the guides so that varying degrees of eccentricity may be obtained between the center of the track and the axis of the rotor, either above or below the center line. When the centers of both parts coincide, no relative radial motion takes place between the rotor and the ball pistons. As the degree of eccentricity is increased the quantity of oil delivered by the pump increases likewise until the limit of travel is reached. When the track engine is raised above the center, flow takes place in one direction and this direction is reversed when the track is moved to a position below the center line.

In each of the five cylinder recesses there is a port *F* with a hardened base and a floating valve (not shown in the drawing) having a rocking motion and also a rotating motion so that it can adjust itself to the position of the rotor. This valve carries the inlet and outlet ports.

By combining two machines of this type it is possible to make a variable-speed transmission gear. One machine is driven by a prime-mover at constant speed and acting as a variable-stroke pump delivers oil under pressure to the other machine which acts as a hydraulic motor. This can be done by coupling up two Carey machines back to back, but with their respective back covers replaced by a single junction casing which carries the two floating valves and provides the necessary passages for the flow and return of the working fluid. The ratio of speeds between the driving pump and the driven pump is controlled by the lengths of the strokes of the two machines.

It has been found that for speeds up to 500 r. p. m. these transmission gears may be filled with oil, but for higher speeds it is desirable that the rotor should run in air.—(*The Engineer*, Sept. 17, 1920.)—*The Journal of the Am. Soc. M. E.*, December, 1920.

MISCELLANEOUS

WHY NOT THE TORPEDO MOTOR BOAT CARRIER?—In the contest last summer for the Harmsworth Cup, the race was won by a little 26-foot motor boat which is credited with an official speed of 70 miles an hour. It detracts nothing from the credit of the victory to say that *Miss America* consisted of a pair of Liberty engines with a boat built around them. She showed what the gasoline motor was capable of doing under extreme conditions of maximum power of engine and minimum size and weight of boat.

To the serious naval constructor, who at no time in the progress of his art has been hedged about with so many and so difficult problems as to-day, the mere fact that any kind of a sea craft has made 70 miles an hour should be a matter of great significance. He knows full well that, starting with a basis of two Liberty motors, or 800 horsepower, which is what *Miss America* carried, it would be possible to build a torpedo-carrying motor boat whose offensive power could be increased in proportion as speed was sacrificed. To put it more concretely, he could make a guess off-hand that a modified motor boat of the *Miss America* type, larger, stronger and more seaworthy, could be built that would carry a 21-inch torpedo at a speed of 40 knots. *Miss America* was built for fair weather and smooth water, and it is well understood that the phenomenal speed of these little craft falls in proportion as the seas run high. Nevertheless, it is quite possible, by increasing the size and modifying the model, to produce high-speed craft which will hold their speed under conditions in which the out-and-out hydroplane of the *Miss America* type would be helpless.

Rear Admiral Taylor, Chief Constructor, in his recent masterly summing up of the naval lessons of the war before the Franklin Institute, commented favorably upon the work done by Allied motor torpedo boats during the war. "The little boats," he said, "performed splendid service off the Belgian coast," referring, no doubt, to the British 40-knotters, which, on their very first cruise sank a German destroyer. He stated also that "the most spectacular and at the same time most valuable service performed by boats of this type was the daring penetration by the Italians into a fortified Austrian harbor, where they sank a battleship lying at anchor. Later, in operations against the Bolsheviks, a small British flotilla penetrated to the inner harbor of Kronstadt, where they succeeded in sinking two battleships and two other large vessels."

These performances seem the more remarkable when we remember that they were accomplished by experimental vessels, the first of their type to be built. Subsequent improvements, as worked out in this country, are in the direction of greater size and seaworthiness, coupled with a wider range of action, better accommodations for the crew, and ability to carry the largest torpedoes.

The point is made by the naval constructor that the objection to such craft is that they are too small to keep the sea with the main fleet. It is undeniable, on the other hand that, were it possible to take two or three flotillas of 40-knot, torpedo-carrying motor craft into such an action as that at Jutland, they would inevitably exercise a controlling influence on the tactics of the battle, and might well prove to be its deciding factor; for we must remember that there was a calm sea at Jutland throughout the whole of the day and night engagements.

But how are motor boat flotillas to reach the scene of a battleship engagement on the high seas? They have neither the cruising radius nor the sea-going qualities to enable them to cruise with the fleet. So, if they are to get to Jutland, they must be carried there. In this respect the problem is parallel to that of the airplane which, it was known, would be a formidable weapon could it be present in numbers at a naval engagement. In the case of the airplane the problem was met by designing special airplane carriers, and in the case of the torpedo motor boat it can be solved in the same way by providing motor boat carriers. These would be unarmored cruisers about 800 feet in length and of 35-knot speed, specially built for carrying forty boats on two decks. The boats would be stowed, two abreast, throughout the full length of the ship, and electrically operated davits would be provided with gears sufficiently powerful to put the first flotilla of twenty boats in the water within a few minutes' time and a second flotilla of the same size shortly thereafter.

It is a question worthy at least of consideration, whether four such ships, taking position on the four wings of an enemy's line of battle would not constitute a more deadly threat than four battle-cruisers of the same size and speed. We do not say that they would, but we do claim that the question is worthy of the most careful consideration of our naval constructors, of our War College and of the General Board of the Navy.—*The Scientific American*, Nov. 20, 1920.

THE LEAGUE'S SWADDLING-CLOTHES.—A child wrapped in swaddling-clothes, according to a custom not everywhere extinct, may not be a very lively infant, but its immobility is not to be mistaken for death. So the infant League of Nations begins life all bound round with a complexity of prejudices and distrusts and legal limitations and financial difficulties and political obligations, hindrances, and burdens of every kind. Among the observers about the cradle some predict that these wrappings will smother the child, others that the child will manage to survive though handicapped for a while, and still others believe that these bonds will actually help development into straight and sturdy youth. Many editorial friends of the League are frankly disappointed with the results of the Assembly's sessions at Geneva, anti-Leaguers who once professed to fear a "super-government"

now jeer at its "helplessness," while others set themselves to balance fond hopes and gloomy apprehensions against the actual accomplishments reported from the League's headquarters. One view is well represented by the disappointed liberal editor who thus sums up the situation in *The Nation*: "The League, born as a splendid dream of international peace, is settling down to a task of international clerking which it can do well and which it is well that some such organization should do. But success at settling the Aland Islands question or at regulating cable control should deceive no one into believing that this is the League to end war for a vision of which men died." Correspondents of the Hearst newspapers follow up their chief's campaign against the League by reporting that "within the austere hall of the Calvinist Reformation at Geneva the most sordid battle has been engaged in for purely selfish motives under the cloak of the Universal Brotherhood of Man." But a New York *Times* correspondent observes that despite obstacles, both temporary and permanent, the big accomplishment of the Assembly will have been that "forty-one nations met at the same table to discuss their affairs and difficulties. That never happened before in the history of the world." "The solemn declaration of Senator Harding and Senator Lodge that the League was dead was made almost ludicrous by the animation, by no means of a galvanic sort, which marked the opening reading of the Assembly," says the Springfield *Republican*. The League, we are told, "may blow up, and it is necessary to recognize the perils, internal and external, by which it is beset, but it is not likely to pass away quietly in its sleep." For this first session of the League's most popular body showed conclusively, in the opinion of *The Republican*, that it is filling a long-felt want; because, though executive action is taken by the League Council, "the Assembly does give even the small nations a chance, which in the age of dreadnought states they had lost, to get a hearing and to exert influence. It does for them something like what proportional representation does for minority parties; the great states, like the great parties, may prevail, but it is something—indeed, it is very much—for the smaller groups not to be disfranchised."

"The small nations are in control in the Assembly," says a New York *Herald* writer. In particular, as several correspondents observe, the point has been reached where the Latin-American states are in a fair way to gain a balance of power. Hymans, a Belgian, was elected President. Out of twelve chairmanships and vice-chairmanships of committees, nine were given to Latins, all but three of them from Latin-American countries. At the very opening session a call was made for amending the League Covenant to provide that the member states of the League Council be elected by the Assembly instead of having the big Powers kept in the Council in perpetuity. The Assembly, observes Mr. Charles A. Selden, New York *Evening Post* correspondent at Geneva, as it represents all member states, "does not propose to be the dog wagged by the tail, which latter, in its opinion, is the Council representing only eight states." This attitude is wholesome, declares Mr. Selden, who continues:

"That there are differences in the Assembly itself and that the Assembly is determined to give greater democracy to the Council are healthy signs of the League's virility and must not be mistaken for weakening dissensions. Another year of such complete and deadly harmony as the Council has displayed since its organization would have been a real danger. Not so this man-fashion give and take of Slavs, Scandinavians, Latins, Anglo-Saxons, and Asiatics."

At Geneva, according to Mr. Selden, it has become an axiom that the defence of the Council in its present form "labels a delegate as a reactionary." The New York *Globe* sees in the contest between the small and neutral nations so powerful in the Assembly and the Great Powers represented in the Council a great struggle between the old statecraft and the new. The dissension, it says, is "between those who stick to the temporary advantages of the old system and those who are willing to make temporary sacrifices in order to promote the new." That is:

"The neutrals and the smaller nations, who stand to gain most with the least loss, are in favor of complete and immediate acceptance of the new obligations the belligerents, who have on their hands an immense amount of the spoils of war, are more reluctant.

"The meeting at Geneva has taken the form of a skirmish between the old and the new. The old statecraft won when it was decided that meetings of the powerful Assembly commissions should be held in secret. It won again, if Mr. James, of *The Times*, is to be relied upon, when the representatives of the mandate-holding Powers were given a real, although not a nominal, control of the mandate commission. It wins whenever the Council takes away a function from the Assembly or assumes a new and arbitrary function of its own.

"But this was to be expected. The ideals of the League preamble can be realized only after a long and persistent assault upon the seats of arbitrary power. Against the will of the secret council chamber, when that will is reactionary, must be directed the will of an informed world public. That is the Assembly's main business, and it is carrying it forward not wholly without success."

On the other hand, some are disappointed at the little progress made along these very lines. In a dispatch to the *New York Herald*, Mr. Laurence Hills says that too many representatives of the small nations the League under its present organization "is appearing more as an alliance of the large Powers to defeat the more liberal aims of the smaller ones." There is disappointment, he says, because no strong stand was taken for disarmament, because all proposals for amending the Covenant were put over until next spring, and because of the failure to organize the international court of justice, "with a compulsory jurisdiction feature which would permit the small nations, provided a large Power was the aggressor, to summon such a Power into the court." Seeing the futility of getting the Great Powers to reduce armaments, "the small nations have lined up behind Brazil's resolution to make the manufacture of armament a state monopoly." Another evident disappointment, we read:

"Is the discovery that the mandate idea in the Covenant is a mere fiction. Virtually all the non-mandatory nations in the League have the same idea as was expressed by the United States in her note to Great Britain on the Mesopotamian oil case, namely, that all nations have the same advantages economically under the mandate plan, but Great Britain has advanced a theory here from which it is plain she is not to be dislodged from control of the Mesopotamian oil fields, that she assumed the mandate for Mesopotamia at a heavy loss and that economic privileges must go to the mandatory Power as partial reimbursement when such Power carries 'the white man's burden.' Also it was insisted that mandates were irrevocable; that they constitute perpetual trusteeship."

Though the Geneva gathering was larger than The Hague conferences, *The Nation* finds two "profound differences," to the discredit of the recent one:

"Two great nations, Germany and Soviet Russia, are ostracized, uninvited to the meeting; and the little nations enter this conference not with equal rights but as lesser partners in an enterprise bound to the chariot-wheel of the Entente victors. It is this stringent domination of the so-called Great Powers which infects the very basis of the League; this, the difficulty of amendment of the Covenant, and the unanimity required for important decisions which render the Council of the League as helpless as the old Polish Diet in which any one member could veto the decisions of all the others."

The most thoroughgoing condemnation of the Geneva Conference, however, comes from a correspondent of the Hearst papers. As Mr. C. F. Bertelli listened to the speeches at Geneva, he could feel human nature "reverting to the primordial instincts of the cavemen." And he sums up his discoveries about the selfish designs of the Powers represented at Geneva as follows:

"Great Britain fights for the world's hegemony.

"France wants the League turned into an instrument for the coercion of Germany in order to wring the last cent from her former enemy.

"Italy is keeping in mind her necessity to import iron, wheat, and coal, and she asks the members of the League to pool their own resources of raw materials.

"Japan intends to become a Power of the first magnitude, dictating her policy to the white races, and she covets Siberia.

"The smaller countries act as satellites to their chosen bigger Powers, and take the attitude of beggars in order to achieve their own particular ends, while Chile and Peru apparently have come to Geneva only to call each other names.

"The Assembly is a beehive of gossip and intrigue, the delegates engaged in a catch-as-catch-can game. Everybody seems demoralized by the very atmosphere permeating the entire organization.

"When a courageous member of the League dares to speak in the name of justice, his words are left unanswered amid the general indifference.

"Never before has the absence of the United States from a world council been so noticeable.

"The League lacks the moral foundation which only the United States can give it.

"Every one present is a member of a delegation of a nation that profited from the armistice somehow or other."

A writer more friendly to the League, Mr. Edwin L. James, correspondent of the *New York Times*, finds two very serious barriers to the League's success, which were disclosed at Geneva:

"First, the fact that the World War has not been finished long enough to permit sincere cooperation by the nations of the world.

"Secondly, the absence of the United States and Germany."

Mr. James explains with some care the importance of these barriers which, he thinks, time may remove:

"I have said that the meeting has taken place too near the Great War. How can this be better shown than in the question of disarmament, a matter about which League enthusiasts hoped to make great progress at the meeting? But Bourgeois, for France, lays down the hard fact that France will not take a single step until Germany fulfils the terms of the Treaty of Versailles and until the Allies have the complete power of investigating the state of German armament. Yet Bourgeois admits that Germany has begun to fulfil the Treaty terms, and that is considered hope for the future.

"Again, France is absolutely against the entry of Germany into the League and has blocked it until Germany shows a better disposition toward the fulfilment of the Treaty terms. This is another echo of the war. Many delegates express the opinion that it was a mistake to give the League any task in enforcing the Treaty, for whenever any question of that sort comes up those countries which were neutral during the war scoff.

"The absence of the United States also places a barrier on the whole question of disarmament. This Assembly will name a commission to study the problem, but the question may be asked, how is any one to suppose that England and Japan will agree to limit the number of their warships while America, not being a member of the League, does not submit to a similar undertaking?

"The absence of America and Germany also compromises the position of the World Court and is responsible for a certain shyness toward it by the Powers in the League. There is a distinct unwillingness to give the court power to hale all independent nations before it, and without this power, Elihu Root said at The Hague, the World Court is not very much of a fact.

"America's absence also hinders progress toward amending the Covenant, which is held to need changes, and now the leaders have decided it would be better not to take up amendments until after they know where America stands."—*The Literary Digest*, Dec. 11, 1920.

OIL TROUBLING THE DIPLOMATIC WATERS.—The world is oil mad, declared a British knight who recently visited our shores. "Certainly the world has a tremendous oil thirst," agrees the *Newark Evening News*, "and the nations are elbowing each other—none too politely—in the neighborhood of the oil-springs of the Near East." In our State Department and in the chancelleries of Europe this elbowing becomes a subject for polite notes of remonstrance on one hand and assurance on the other. Secretary Colby's recent note to Lord Curzon, British Foreign Secretary, concerning Mesopotamia, insisted, in the words of the *Springfield Republican*, "upon the claim of equality of economic opportunity for the United States regardless of its non-membership in the League of Nations." Other editors point out, however, that "oil" was the burden of the note, and the Washington correspondent of the *Philadelphia Public Ledger* declares that it "was framed in counsel with the oil interests of this country, and may be regarded as representing the views of that great industry." A Washington dispatch to the *New York Times* says London editors were quick to intimate that the sole motive behind Secretary Colby's note was to enable the United States to share in the oil of Mesopotamia, but this is denied by Washington officials; "the United States had nothing in mind except principle," they aver.

At any rate, says the *Seattle Times*, "the game of 'freeze-out' is being played on a gigantic scale in oil-producing regions." In explanation the *Philadelphia Public Ledger* declares that "the British bar civilians of all countries—their own included—from prospecting for oil in Mesopotamia, but British army experts go on developing 'for military purposes.'" Oil, therefore, thinks this paper, "bids fair to replace gold as the chief subject of international differences in the future." "In Mesopotamia there is oil, and this is the oil age," significance adds the *Boston Globe*, which also reminds us that "what the United States is asking on the subject of Mesopotamia oil is exactly what we have always been willing to grant to the whole world."

The note of the British Government, to which Secretary Colby's note is said to be a reply, has not been made public, although it was received by our government last August. In consequence, the American people have heard but one side of the controversy. In his latest note Secretary Colby said, among others things:

"I need hardly refer again to the fact that the Government of the United States has consistently urged that it is of the utmost importance to the future peace of the world that alien territory transferred as a result of the war with the Central Powers should be held and administered in such a way as to assure equal treatment to the commerce and to the citizens of all nations. Indeed, it was in reliance upon an understanding to this effect, and expressly in contemplation thereof, that the United States was persuaded that the acquisition under mandate of certain enemy territory by the victorious powers would be consistent with the best interests of the world.

"It is assumed, accordingly, that your statements with reference to Mandate A, together with the statement that the draft mandates for Mesopotamia and Palestine have been prepared with a view to secure equality of treatment for the commerce and citizens of all states which are members of the League of Nations, do not indicate a supposition on your part that the United States can be excluded from the benefits of the principle of equality of treatment.

"This Government is pleased to find that his Majesty's Government is in full sympathy with the principles formulated in its communications of May 12 and July 28. But it is unable to concur in the view contained in paragraph 15 of your note, that the terms of the mandates can properly be discussed only in the Council of the League of Nations and by the signatories of the Covenant. . . .

"The United States, as a participant in that conflict and as a contributor to its successful issue, cannot consider any of the Associated Powers, the smallest not less than itself, debarred from the discussion of any of its consequence, or from participation in the rights and privileges secured under mandates provided for in the treaties of peace.

"The United States is undoubtedly one of the Powers directly interested in the terms of the mandates, and I therefore request that the draft mandate forms be communicated to this Government for its consideration before their submission to the Council of the League."

"We did take part, and an important part, in the far more vital business of winning the war which made the Treaty of Versailles and the distribution of mandates possible," the Philadelphia *Public Ledger* reminds us. "The Covenant of the League of Nations was not in existence when our boys went under fire at the Marne," adds this paper, and the Washington *Star* agrees that "if the United States has any rights as an associate in the winning of the war, and as signatory to the Treaty, they are not lessened by the fact that ratification has not yet been effected." "Whether we join the League or not," declares the Brooklyn *Eagle*, "we are bound to see to it that other nations do not monopolize the economic benefits to be derived from the exploitation of territory we helped to free from the Central Powers." The Baltimore *American* believes that we would have "a less-privileged position" as a member of the League than we now have out of it, as in the League we would be "subject to and bound by League decisions." But, declares the Chicago *Daily News*:

"In the League or out of it, the United States has every right to ask to be consulted respecting the terms of the proposed mandates over Turkish or German territory. Natural resources in those territories should be developed primarily for the benefit of the respective resident populations and not in the interest of the mandatory Power.

"The United States is not a member of the League, but it may become one, or it may suggest the creation of a new association of nations. In any case, the mandate principle will undoubtedly be recognized and established as infinitely superior to the policy of grabbing conquered territory and exploiting it for the exclusive benefit of the state that holds the mandate.

"The United States is just as much interested in these mandates . . . as any nation that is a member of the League, and every mandate question that arises . . . should also be referred to the United States," asserts the Des Moines *Register*. "It is not a Democratic or a Republican question, but a national question, that the possible disintegration of the Mesopotamian mandate has raised," adds *The Register*, and we read on:

"The relation of the mandate principle to the League of Nations is not incidental, but fundamental. It was not grafted to a League, nor was a League grafted to it. They are part of the same growth, mutually dependent parts of the same idea, and will survive or fall together."

"Important as the oil question is," points out the Indianapolis *News*, "it is less important than observance of the provisions of the League Covenant with reference to mandates. Under this Covenant it was intended that mandatory nations should be trustees, not simply for the League, but for the world. The question really is whether the selfish interests of the mandatory nations shall prevail rather than those of the people subject to the mandate, and of civilization." Then *The News* cites the San Remo agreement entered into by England and France last April:

"By the recent San Remo agreement 75 per cent of the oil of Mesopotamia was assigned to Great Britain and 25 per cent to France. It was also provided that any private petroleum company which may develop the Mesopotamia oilfields shall be under permanent British control. There could hardly be a clearer violation of the spirit and indeed, as is believed, the letter of the League Covenant than this arrangement."

"In dealing with a great international question like that of oil supply it is deplorable that petty national jealousies should be permitted to cloud the

issue," remarks the *New York Journal of Commerce*. "Let us remember that if another war is to come it will mainly be in the air and under sea; that the motor force for hostile activities must be oil, and that the control of the world's supply of oil by the Allies would make war by any future enemy a practical impossibility." This responsible business journal then notes that "the per capita consumption of petroleum in the United States has been 220 gallons, as against an average of 14 gallons per capita for the whole world," including this country. Of approximately eight million motor cars in the world, all but half a million are in the United States, we are told, besides about 90 per cent of the world's supply of internal-combustion engines. Furthermore, points out the *Baltimore Sun*, "the United States is now importing 83,000,000 barrels of petrol annually, consumption having mounted far beyond our domestic production." "The facts of the situation," adds *The Journal of Commerce*, are these:

"The world production of petroleum in 1918 was 70,000,000 tons, of which 50,000,000 was credited to the United States. The total British Empire production was 2,080,000, and that of Persia, virtually controlled by Great Britain, was 1,500,000 tons. In other words, the United States produces in her own territory nearly 70 per cent of the world's total output, and if the quantity produced by American companies in Mexico is added we should have a figure representing at least 80 per cent of the entire world's oil supply. On the other hand, the British Empire, with Persia added, has so far achieved nearly 4½ per cent of the whole."

But "the amount of oil possessed by the United States has nothing to do with the morality of Britain's action in Mesopotamia; American oil was not acquired under pretense of a mandate and then transformed into a monopoly, declares the *Washington Post*, which then reminds us that Mr. Lloyd George "made a strong argument against America holding all the German ships she had acquired," saying that "they belonged to all the nations that had fought on the Allied side."

Secretary Colby's note will serve to focus attention on British policy in Mesopotamia," thinks the *Boston Transcript*. And—

"British actions in this remote quarter of the globe furnish a test not only of the whole mandate principle, but of the motives and the purposes underlying post-war European diplomacy. If the San Remo agreement is used to advance British commercial supremacy in Mesopotamia, the world will have good cause to become suspicious of all the diplomatic bargains made by the powers of Europe. The note of the Department of State provides the British Government with an opportunity to explain whether or not it is acting in good faith in Mesopotamia. The world awaits and expects a prompt reply."—*The Literary Digest*, Dec. 11, 1920.

MEXICO ON THE WAY BACK TO NORMALCY.—The yearning for a return of the good old days of normalcy, which at this time apparently prevails in our own beloved land, seems to have spread also to our neighbors in Mexico. This does not mean that the hectic conditions in the southern Republic have been entirely overcome, but the signs are hopeful. For instance, it is said that during the administration of Carranza many citizens stabled their mules and other valuable live stock in the parlors of their homes. Now confidence has been restored to a point where even the best mules are corralled outdoors, or merely hidden in the brush. Another good sign is the absence of small but annoying insect pests from the trains. These little disturbers added their mite to the general misery of the situation during Mexico's darkest days, we are informed by Americans compelled to travel there then. Now they are gone, and their going furnishes an illustration of the general improvement that has taken place in the Mexican train service, which includes, also, better equipment, better time, and no guards to protect the passengers from marauders. The betterment of transportation may in turn be taken as an illustration of how the

country has improved along all lines during the last six months. The standard of living is higher, there are better clothes and food, mines are being opened and roads built, little pueblos, almost swept out by the *revolucionarios*, are suddenly springing into activity, and there are more jobs, more money, and busier market-places.

"Few outside of Mexico realize what its ten years' revolution has meant," says Sophie Treadwell in the New York *Tribune*, after six months in that country. She describes conditions during the revolutions as an "almost complete paralyzation of every kind of work, a constant confused inner war, with thousands of cars blown up, miles of track torn away, hundreds upon hundreds of men turned by the pressure of necessity from laborers to bandits, and any attempt at a quiet, self-respecting life impossible for high and low alike." Miss Treadwell continues:

"Elegance, lavishness, richness, flew first from Mexico with the fall of Diaz. Then culture; then, one almost might say, decency. Until, with the end of the Carranza régime, a sodden hopelessness was everywhere; and all that remained of the old national character was a certain baffled pride, sensitive beyond all reason.

"Beauty only has remained unimpaired in Mexico. Mexico City, with her Spanish doorways, Moorish tiles, French driveways, her native flowers and fountains. Under her, the dark ruins of a destroyed people. Over her, the brilliant, incomparable Mexican sky, with Popocatepetl's metallic snow shining through the delicate clouds; Iztacihuatl, the sleeping woman; the floating gardens of Xochimilco, the castle, high over the trees of Chapultepec.

"Beauty has remained in Mexico. And hope is beginning to come back. Suspiciously, it is true, but still coming back. Can it be that peace will come again—real peace, security, prosperity, gaiety?

"As Carranza used to say to all questions of state, however ardently put to him: '*Pues, quien sabe?*' ('Well, who knows?')."

Mexico, says the writer, looks with a hopeful eye to the future to-day particularly because of the character of the men now in control. They are all from the north—Sonora—and in the veins of most of them flows the blood of the Yaqui, the Indian who never gave up, the one unconquered native of Mexico. We read further:

"Sonora is the big state farthest to the north and west of Mexico (with the exception of Baja California, which, in its geographical and political isolation, seems more like an island than a peninsula). Sonora is farthest from the tropical south of Mexico, farthest from the dominating influence emanating through centuries from the capital; nearest to the United States. Some of her border towns seem half-American. The frontier Sonoran speaks English and knows American ways.

"These are the Mexicans who now control Mexico: Obregon, Hill, Calles, de la Huerta—all Sonorans; all, with the possible exception of Obregon, carrying in their veins some few drops, more or less, of native blood.

"And these are the men who have brought at least a gleam of hope into the surrounding black of their poor country's despair.

"Although their seat is still insecure—within, new personal dissatisfactions, old personal hates; without, as yet, comparatively no recognition—yet business everywhere has taken a new impulsion. Orders for foreign trade are being placed. Land prices, at their lowest ebb, are beginning to go up. Tremendous efforts are being made to get the railroads working, the country's products under transportation. I understand it is still impossible to get a car-load of freight moved without 'oiling the way' all along the line. But I know one can buy a passenger ticket without 'passing a little change'—even get Pullman reservations."

One of the hopeful signs in Mexico is that the people seem to be going to work. To the town of Taxco, where an ancient silver-mine was opened up, 3000 laborers flocked within a short time. The writer was told of former revolutionary "generals," "colonels," and "majors" who have quit

their revolutionizing and are now content to work at road-building for seventy-five cents a day. Something of culture, also, is coming back. We read:

"Adolfo de la Huerta, the Provisional President, is an artist, a musician. He has tried, among the many more demanding urgencies upon his time, to give what stimulus he could to music.

"A clever company of comedy and burlesque players has lately come from Madrid. A brilliant writer and director of light opera, Señor Penella, has brought a company from Spain. The theaters are crowded. And an original production of Maestro Penella's, 'El Gato Montes,' has met with enthusiastic response.

"Of course, the native general wide-spread love of music in Mexico has been commented upon to the point of being tiresome. I confess I expected more from the wild native guitarist than he was able to deliver. But I always enjoyed that moment in the cinemas when the orchestra happened to go into an unpopular piece, in the midst of the star's big scene. And the entire audience, oblivious of the drama unfolding before its eyes, would burst into loud thumpings of protest, each one turning around and expostulating against the outrage with the person behind, until the orchestra was drowned out and began something else, when quiet was restored and the picture, hundreds of feet having passed unseen, was again contemplated. The iron-clad complacency of many a "movie" star would get a jolt, I think, from a Mexican audience, realizing that even the dullest Mexican peon isn't at all fooled by what is done on the screen, while he remains exquisitely sensitive to every note that is being played. A Mexican goes to the cinema to hear the music. The picture is just something thrown in.

"Something of hope, much of work, a little of culture, have come back to despoiled Mexico. But elegance has not as yet. I think I saw only one really well-dressed woman there in all the six months. Maria Conesa, the actress, understands the chic of simplicity. Her costumes were most beautifully and simply brought together, hat, gown, gloves, and shoes.

"She was the only woman I saw who, as the French say, could 'support the detail.' And one looks to women, instinctively, to reflect the elegance of a country, if there is any.

"While Mexico has lost many things during the last troublous ten years, it appears that 'personal liberty' still flourishes there. Miss Treadwell illustrates with a story:

"Just a few nights before I left the capital I was talking to an American gentleman. Our subject was, inevitably, Mexico. That is all Americans down there ever talk about. And this gentleman was, inevitably, abusing it.

"But perhaps you don't really know the country?" I suggested timidly. Much disgust.

"Been here twenty-five years!

"Well—more timidly—if it's as bad as you feel, why haven't you gone home?"

A pause. A hush. Then—

"I haven't gone home, as you put it, for one reason, and one reason only. There is still personal liberty here."

Of course, he may have meant by personal liberty just his cognac when he wanted it. Or he might have meant only that personal freedom that comes to any "man from home" in any foreign land. But I think he meant something more than that. I think he meant, in spite of his prejudice and dislike, the thing that was America's boast a generation ago; the thing the Mexican, de la Huerta, was trying to keep alive in his most distressful country when he deliberately removed the censorship in the first darkest, most doubtful days of his Presidency; the thing he is still trying to keep alive when he refuses, at the behest of the strong of the earth, to put out the weak who have sought refuge within his country's disordered borders. No amount of pressure has so far been able to make de la Huerta deliver

over any foreigner in Mexico, even an American, not wanted for an actual extraditable offense."

Miss Treadwell praises President de la Huerta. Though of humble origin, he has proved himself during his short administration a man of true distinction, she says. A side-light on de la Huerta's character is furnished in the description of a luncheon he gave to all the foreign correspondents. We read:

"He was sick, held to a trying diet, overworked, overstrained nervously; his position precarious, dangerous; surrounded by a poisonous atmosphere of cynical criticism and suspicion. The luncheon was long, filled with food he couldn't eat. The conversation was most difficult. It wasn't conversation; it was a cross-questioning, a grilling. Questions were hurled at him, literally, from all quarters of the world. Questions whose answers deeply affected his own future and that of his country; questions flung at him with that swift, brutal, incisive frankness of the American newspaper man at home and abroad. Questions, some of which must have embarrassed him, many enraged him, and all of which tested him through and through. All his answers were invariably gracious, quick, comprehensive, graceful, witty, at times brilliant. The whole tone of the man, simple, unassuming as he is, was, in some subtle essence, distinguished. He is of Polish, Italian, Spanish, and Yaqui blood. His father was a small merchant in Guaymas."

One of the obstacles to progress in Mexico is the provincialism of the country outside the big cities and the isolation of one town from another, especially industrially. For instance, in one town only sweets are obtainable, while in the next one one can buy only knives, or blankets, or saddles. Says Miss Treadwell:

"Each little community entirely given over to making the same thing. Each man in depressing competition with his neighbor. And no provision made for exchanging the one product with something desperately needed from the next town.

"What of modernity has centered in the capital seems never to have been strong enough to permeate to the provinces. One can travel far in Mexico and keep unbroken the impression of a purely primitive civilization. I went for days on horseback through the state of Guerrero, which is one of the naturally richest states in Mexico. In its bigness, beauty, and fertility, I was thinking constantly of California in the spring. Yet the road from its capital, Chilpancingo, to its biggest seaport, Acapulco (one of the finest natural harbors in the world), is an almost impassable trail over the mountains, so rough only burros can take freight over, so narrow in many places only one burro can pass at a time."—*The Literary Digest*, Dec. 11, 1920.

MINOR NAVAL POWERS.—Although it is now generally admitted as a result of the experience of the war that the battleship remains the final arbiter of sea power and the unit on which naval strength is built up, none of the nations in Europe seems inclined, in their present financial state, to consider the provision of new vessels of this class. At the same time, if the United States and Japan continue to make progress at their present rate it will be almost impossible for the policy of any great European Power which desires to remain in the front rank as a maritime nation not to be affected. As Germany and Russia may practically be ruled out of account, the only theater in which it is possible, though not a all probable, that a clash of interests may occur is the Mediterranean, and as was shown in these columns a month ago, Austria has disappeared from the list of first-class naval powers, and so far as competition between France and Italy goes, it is a race to reduce their naval commitment rather than otherwise.

The minor naval powers are in a more advantageous position in that they can proceed with the maintenance or development of their forces along pre-war lines without having to incur the enormous expense of

battleship construction. The recent exposition of the naval policy of Holland illustrates this clearly. While considering disarmament premature in present circumstances, and therefore opposing the reduction of the fleet, the Dutch Government takes the view that its defence by sea can be undertaken with "small material," such as coast defence ships, submarines, minelayers and aeroplanes, with a few light cruisers for service in the colonies. It is, therefore, only proceeding with the construction of two light cruisers, the *Java* and *Sumatra*, at Flushing and Amsterdam. Possibly these additions to the Netherlands Navy will influence Belgium to start a naval force, to consider which question a committee was appointed last year by the Defence Minister. A Naval Commission has also visited Devonport to inspect certain sloops with a view, it was understood, of purchasing one for the proposed Belgian Navy.

The Northern European Powers are exhibiting no keenness to augment their naval forces just now. Denmark, however, has recently taken the opportunity to acquire on favorable terms one of the surplus British sloops, and has bought the *Asphodel*, which was formally handed over to her at Harwich on July 6. Construction is also proceeding slowly on the coast defence ship *Niels Juel*, which was launched at Copenhagen in 1918, and is somewhat similar to her four existing armored ships. There is an absence of information from Norway, but Sweden is continuing the building of the armored cruisers *Drottning-Victoria* and *Gustav V.*, of 7605 tons, launched in 1917. As regards Poland, the hope is cherished that she may eventually have a small naval force of her own, and there is a British Naval Mission under Commander E. L. Wharton which is advising on technical questions, such as harbor development, mine-sweeping, and the like. The six ex-German torpedo boats to be handed to the Poles after disarmament for police duty will afford the nucleus of such a force. The Estonian Navy has received the addition of the late Russian gunboat *Bobr*, and Latvia is desirous of starting a naval force of her own.

Another new nation aspiring to the possession of a small navy is Serbo-Czecho-Slovakia, which is due to receive a dozen torpedo boats from the former Austro-Hungarian Navy after they have been disarmed. Greece, too, which already has a respectable fleet, and knows how to use it, as was shown during her war with Turkey, is incorporating the Austrian destroyer *Ula* and six torpedo boats. There is, however, no sign at present of any active competition between the minor powers such as involved heavy expenditure on new ships before the war.—*The Army and Navy Gazette*, Nov. 13, 1920.

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NOTES ON INTERNATIONAL AFFAIRS

FROM NOVEMBER 10 TO DECEMBER 10

PREPARED BY

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UNITED STATES

SECRETARY COLBY VISITS SOUTH AMERICA.—On December 4 Secretary of State Bainbridge Colby, accompanied by a staff of army and naval officers and department officials, left Hampton Roads in the U. S. S. *Florida* to visit Brazil, Argentina, and Uruguay as representative of the nation, to repay official visits made by public men of those countries.

TREATY NEGOTIATIONS WITH MEXICO.—On November 30, the eve of General Obregon's inauguration as President of Mexico, Secretary Colby made public a letter to the Mexican special representative, Robert V. Pesqueira, formally proposing that "commissioners be promptly designated by both Mexico and the United States to formulate a treaty, embodying the agreements that have been reached." The letter cites with approval the declarations of President de la Huerta and President-elect Obregon that Article 27 of the Mexican Constitution "is not and must not be interpreted as retroactive or violative of valid property rights." It also approves Mexico's proposal for a joint commission to arbitrate claims of other countries.

DIFFICULTIES AT CABLES CONFERENCE.—Difficulties arising at the preliminary communications conference held at Washington in November and December led Acting Secretary of State Davis on December 10 to lay the points at issue before the Senate Foreign Committee. In general, the Allied Powers favor government control of cables, and claim that rates can be made much cheaper under such control. Private companies in the United States raise objections based on the censorship and control that may be exercised by foreign governments both in peace and in war.

The chief objection of the United States is to the desire of Japan to control the island of Yap in the Pacific, which is on one cable line from Guam to Manila, and at the junction of the cables from the Dutch Indies and Shanghai to San Francisco. The future of Yap was discussed at the Peace Conference and it was proposed that the United States should be permitted to acquire the island. Japan opposed this and at present has possession of the station.

It was stated at the conference on December 10 that Great Britain had agreed to turn over the former German cable from New York to Emden, in return for the transfer to Great Britain of one of the American cables to serve England and Canada. A proposal was made that the German cable

from Brest to New York via the Azores, now held by France, should be diverted to Genoa from the Azores and divided between Italy and the United States. To this plan, however, France offered determined opposition.

INSISTS ON RIGHT TO REVIEW MANDATE TERMS.—An important note from Secretary Colby to the British Foreign Office on November 20 insisted that the terms of mandate grants and the various agreements relating thereto are the proper concern not only of the Council of the League of Nations, but of the United States and all other nations associated with the Allies in the war. The note is thus quoted and summarized:

"Such powers as the allied and associated nations may enjoy or wield in the determination of the governmental status of the mandated areas accrued to them as a direct result of the war against the Central Powers. The United States as a participant in that conflict and as a contributor to its successful issue, cannot consider any of the associated powers, the smallest not less than itself, debarred from the discussion of any of its consequences or from participation in the rights and privileges secured under the mandates provided for in the treaties of peace."

The specific point is made that the provision of the San Remo petroleum agreement between Great Britain and France that any private petroleum company which may develop the Mesopotamian oil fields shall be under permanent British control fails to agree with the statements in the British note of August 9, "that the petroleum resources of Mesopotamia, and freedom of action in regard thereto, will be secured to the future Arab State, as yet unorganized," and "that concessionary claims relating to these resources still remain in their pre-war position, and have yet to receive with the establishment of the Arab State, the equitable consideration promised by his Majesty's Government."

Mr. Colby argues that the matter of Mesopotamian resources is "an outstanding illustration of the kind of economic question with reference to which, the mandate principle was especially designed, and, indeed, a peculiarly critical test of the good faith of the nations, which have given their adherence to the principle."

Importance of Oil Resources.—He further insists that "because of the shortage of petroleum, its constantly increasing commercial importance and the continuing necessity of replenishing the world's supply by drawing upon the latent resources of undeveloped regions, it is of the highest importance to apply to the petroleum industry the most enlightened principle, recognized by nations as appropriate for the peaceful ordering of their economic relations."

While the American note accepts British assurances that the British Government has refrained from exploiting resources of mandate territories and welcomes the pledge that Great Britain does not intend to set up "any kind of monopoly or preferred position in its own interest," it recalls the fact that the United States supported the mandate principle primarily on the ground that "it is of the utmost importance to the future peace of the world that alien territory transferred as a result of the war with the Central Powers should be held and administered in such a way as to assure equal treatment to the commerce and to the citizens of all nations."

Referring to a statement in the British note that the draft mandates for Mesopotamia and Palestine, when approved by the interested allied powers, would be "communicated to the Council of the League of Nations," Mr. Colby says:

"The United States is undoubtedly one of the powers directly interested in the terms of the mandates and I, therefore, request that the draft mandate forms be communicated to this Government for its consideration before their submission to the Council of the League."

Then the Secretary adds:

"It would seem essential that suitable publicity should be given to the drafts of mandates which it is the intention to submit to the Council in order that the fullest opportunity may be afforded to consider their terms in relation to the obligations assumed by the mandatory power and the respective interests of all governments which are or deem themselves concerned or affected."—*N. Y. Times*, Nov. 26, 1920.

GREAT BRITAIN AND IRELAND

LLOYD GEORGE DECLARES MARTIAL LAW FOR IRELAND.—In an important announcement of government policy on December 10, Premier Lloyd George declared it was the intention of the British Government to establish martial law in parts of Ireland and to intensify its campaign against "the small, but highly organized and desperate minority" who were "using murder and outrage to attain the impossible." He declared at the same time that the government would treat with Sinn Fein members of the British parliament who had not been "involved in the commission of serious crimes," and that conferences with these Irish representatives had already taken place in London with valuable results. On December 10 martial law was proclaimed in the counties of Cork, Limerick, Tipperary, and Kerry.

HOME RULE BILL PASSES COMMONS.—The Irish Home Rule Bill passed the House of Commons on November 11. This bill provides separate legislatures of two houses each for the North and the South of Ireland, but in general withholds control of foreign relations, military affairs, and finance.

ADRIATIC SETTLEMENT

ITALIAN-JUGOSLAV TREATY SIGNED AT RAPALLO.—Italy and Jugoslavia reached an agreement regarding Fiume and the Dalmatian coast in a treaty signed at Rapallo on November 12. The terms of this treaty make Fiume an independent state, without League control. Italy secures a frontier touching that of Fiume on the west, and thus eliminating the strip of Yugoslav territory between which was favored by President Wilson. Jugoslavia gets as a port the suburb of Sushak near Fiume and all of Dalmatia save the port of Zara, the ancient capital with a population of 32,000, which goes to Italy. Of the Adriatic islands Italy takes only Cherso, Lussin, Lissa, and Lagosta. Albania is left intact.

D'ANNUNZIO HOSTILE TO TREATY.—Following the treaty, d'Annunzio at Fiume still insisted on the recognition of his government, "the Italian regency of Quarnero," which would be practically equivalent to recognition of Italian control. To this Italy could not see her way clear, in view of her agreements with the powers, and friction between Italian and d'Annunzio forces on the Fiume frontier became serious. In mid-December Italy's difficulties in disposing of her soldier-poet remained unsolved.

GREECE

VENIZELOS DEFEATED.—The Greek parliamentary elections of November 14 resulted in a sweeping victory for the opponents of Venizelos. Following the elections the Venizelos cabinet at once resigned and the former Premier left the country. At the request of the regent, Admiral Condouriotis, former Premier and Minister of Finance George Rhallis undertook the organization of a new cabinet. The result of the election was interpreted as indicating weariness of Venizelos' policy of warfare and expansion and a desire for the return of Constantine. The Rhallis Cabinet, however, declared for continuation of the former administration's foreign policy and of the war in Asia Minor against the Turks.

ALLIED NOTES OF WARNING.—Following a conference of Allied premiers in London, a note of warning was despatched to Greece declaring in effect that the return of Constantine might mean withdrawal of financial support and modification of the Turkish Peace Treaty so as to deprive Greece of certain of her territorial accessions. The note read as follows:

"The British, French and Italian governments have constantly in the past given proof of their good-will toward the Greek people and have favored the attainment of their secular aspirations. They therefore have been all the more painfully surprised by the events which have just occurred in Greece.

"They have no wish to interfere in the internal affairs of Greece, but feel bound to declare publicly that restoration of the throne of Greece to a King whose disloyal attitude and conduct toward the Allies during the war caused them great embarrassment and loss could only be regarded by them as ratification by Greece of his hostile acts. This step would create a new and unfavorable situation in the relations between Greece and the Allies, and in that case the three governments reserve to themselves complete liberty in dealing with the situation thus created."

Another note protested against a recent currency issue of the new administration and called attention to the fact that by an agreement of 1897 France and Great Britain exercised supervision of Greek currency.

As regards the situation in Asia Minor, press reports indicated that England favored a policy of continued support for Greece in the hope of retaining the use of her army, whereas France preferred to treat with Turkish nationalist leaders.

GREEKS VOTE FOR CONSTANTINE'S RETURN.—Despite the cold attitude of the Allied powers, the Greek plebiscite on December 5 resulted in an overwhelming vote—about 99% of the total—for the restoration of Constantine. The government reported the result to Constantine in Switzerland, who made plans for his return about December 15.

ARMENIA AND TURKEY

LEAGUE EFFORTS FOR ARMENIA.—On November 20, after heated discussions in which the lack of a League army was deplored, the League of Nations assembly passed a resolution requesting the Council to seek some power to intervene in favor of Armenia. (This action was taken prior to

the news of Armenia's adoption of a Soviet form of government and of peace with the Turks.) In accordance with the resolution, the Council extended an invitation to President Wilson to act as mediator, and the President on November 30 accepted. The President's reply was as follows:

"November 30, 1920.

"M. Paul Hymans, President, Council of the League of Nations, Geneva, Switzerland:

"I have the honor to acknowledge the receipt of your cabled message setting forth the resolution adopted by the Assembly of the League of Nations requesting the Council of the League to arrive at an understanding with the governments with a view to intrusting a power with the task of taking the necessary measures to stop the hostilities in Armenia.

"You offered to the United States the opportunity of undertaking the humanitarian task of using its good offices to end the present tragedy being enacted in Armenia, and you assure me that your proposal involves no repetition of the invitation to accept a mandate for Armenia.

"While the invitation to accept the mandate for Armenia has been rejected by the Senate of the United States, this country has repeatedly declared its solicitude for the fate and welfare of the Armenian people in a manner and to an extent that justifies you in saying that the fate of Armenia has always been of special interest to the American people.

"I am without authorization to offer or employ the military forces of the United States in any project for the relief of Armenia, and any material contribution would require the authorization of the Congress, which is not now in session, and whose action I could not forecast.

"I am willing, however, upon assurances of the moral and diplomatic support of the principal powers and in a spirit of sympathetic response to the request of the Council of the League of Nations to use my good offices and to proffer my personal mediation through a representative whom I may designate to end the hostilities that are now being waged against the Armenian people and to bring peace and accord to the contending parties, relying upon the Council of the League of Nations to suggest to me the avenues through which my proffer should be conveyed and the parties to whom it should be addressed.

(Signed) "WOODROW WILSON."

PROPOSED AMERICAN LOAN.—In acknowledging President Wilson's acceptance, the Council of the League notified him that both Spain and Brazil were willing to participate in action of "moral and diplomatic character" and had been requested to communicate directly with the President.

In his message to Congress on December 7 President Wilson suggested that Congress authorize a loan to Armenia, and the State Department later announced, that unless Congress indicated disapproval, the outgoing administration planned to grant a loan up to \$25,000,000 under proper safeguards.

President Wilson on December 9 delivered to the French Foreign Office his decision as arbiter of the Armenian boundary question. The only comment from the recipients was that the document, with a thick book of maps, was one of the most magnificent ever received, and that the President had allowed Armenia very liberal borders.

TURKS FORCE ARMENIANS TO TERMS.—From Constantinople on November 23 came reports of an alliance between Soviet Russia and the Turkish Nationalists under Mustapha Kemil Pasha, the two partners agreeing to aid each other in "liberating" former Moslem territory and in hostility against the Entente powers. Subsequently it was announced that Armenia had shifted to a Soviet form of government and had turned to Russia for assistance against the Turks. Russia proceeded to warn her Turkish ally against encroachments on Armenian territory.

Finally came news of a peace between the Turks and Armenia signed on December 2, by which Armenia was forced to adopt a Soviet government and reduced to a small district around the capital Erivan.

RUSSIA AND POLAND

ARMISTICE BETWEEN LITHUANIANS AND ZELLGOUSKI.—An appeal from Lithuania reached the League Assembly at Geneva on November 21 declaring that the forces under General Zellgouski were attacking in 15 divisions and were receiving secret support from Poland. Lithuania requested the League to take action under Article XVI of the Covenant which enjoins members of the League against war without first using all reasonable measures to avoid a conflict. At this time the League had already decided to send an armed force—consisting of French, Belgian, British, Dutch, Spanish, Danish, Swedish, and Norwegian contingents—to maintain order during the plebiscite to be taken some months hence under League auspices in the disputed territory.

On November 31, through the efforts of the League commission on the scene, an armistice was signed between Lithuania and the Polish insurgent Zellgouski, providing for cessation of hostilities, return of prisoners, and establishment of a neutral zone.

POLISH-RUSSIAN NEGOTIATIONS DELAYED.—On November 20 negotiations at Riga between Poland and Soviet Russia were interrupted by Russia's accusation that Poland was disregarding the terms of the armistice by failing to withdraw troops from Ukrania. The downfall of all anti-Red forces in Southern Russia made Poland again apprehensive of Soviet aggression.

PLOT TO INVOLVE AMERICA AND JAPAN.—Passages quoted from a speech by Lenin at Moscow in November have been taken to mean that concessions in Liberia granted to the American Washington D. Vanderlip were made for the purpose of increasing friction between the United States and Japan. The significant passages of the speech ran as follows:

"The world revolution, without which our final triumph is impossible, has not developed as quickly as we hoped, still we must bear up till it comes," he said. "Though other countries consider war against us the only means to ward off revolution, they have been compelled to cease military operations against Soviet Russia, and our existence among the non-Soviet countries seems secured now. Meanwhile the revolution will have a chance to develop in those countries.

"Our nation, which for three years resisted imperialism everywhere, has become an international factor. By granting mining and industrial con-

cessions to America we disturb relations between Japan and the United States. We shall make the best of this situation. By granting such concessions we shall gain further material success over the capitalist countries because, instead of fighting us, they will be compelled to watch over our security. We must grant such concessions because one solitary nation cannot defeat the capitalism of the whole world."

LEAGUE OF NATIONS

ASSEMBLY ORGANIZED AT GENEVA.—Representatives of 41 states gathered at Geneva on November 15 at the first meeting of the Assembly of the League of Nations, which continued in session until the latter part of December. The work of the Assembly consisted chiefly of the organization of bureaus, commissions, and other machinery for the handling of international affairs, in case the League should get safely under way. Debates during the session brought out opposition between the great and the smaller nations, between European and non-European states, and against the present domination of the League Council by the Entente powers.

In a speech of welcome President Motta of the Swiss delegation expressed the general hope and desire that the United States should soon enter the League. Paul Hymans of Belgium was elected permanent President. The difficult question of the boundary dispute between Bolivia, Peru, and Chili, involving the application of the Monroe Doctrine, was postponed by request of the nations concerned. The following commissions and chairmen were appointed: General Organization (Balfour, British); Technical Organization (Tittoni, Ital.); Court of International Justice (Bourgeois, French); Finances (de Leon, Spanish); New Members (Humeus, Chili); Disarmament, Blockade, and Mandates (Brantung, Sweden). These committees at once began work, after the decision that committee meetings should be secret, but that committees could hold public sessions if they so chose.

COMPOSITE MILITARY FORCE FOR LITHUANIA.—At the opening of the Geneva session it was decided that various European members of the League, including Great Britain, France, Belgium, Spain, Holland, Denmark, Norway and Sweden, should be asked to supply contingents for a composite force to maintain order and supervise the proposed plebiscite in Vilna and the surrounding territory. It was announced later that Spain, Holland, and other states had given full or conditional assent to this plan. The meaning of Article X was settled by acceptance of the position taken by Denmark and Holland that the consent of parliament was necessary before those governments could contribute troops.

PERMANENT MANDATES COMMISSION.—In accordance with a plan presented by the Assembly Mandates Commission, it was decided by the League Council on November 29 that a permanent Mandates Commission should be created, representing five non-mandatory and four mandatory powers, that these members should all be named by the Council, and that they should not hold positions making them in any way dependent upon their respective governments. The Mandates Commission will sit at Geneva and will receive annual reports from the mandatory powers. In any controversy the representative of a nation involved will not be entitled to vote.

APPLICATIONS FOR MEMBERSHIP.—At the opening of the Assembly it was decided that applications for entrance into the League on the part of Austria, Bulgaria, and Albania should be given consideration, though their applications were filed after October 14, which was the time limit set.

On December 9 the commission on new members reported favorably in the case of Bulgaria. Finland and Austria were also given favorable consideration. As for Albania, Armenia, Ukraine, and the Baltic states formed out of former Russian territory, it was thought for various reasons that conditions did not at present warrant their admission as independent nations.

Geneva, November 21 (Associated Press).—The Committee on Admission of New Members is considering the application of fourteen states, including Germany. These applications are:

From Finland, Esthonia, Letvia, Lithuania and Luxembourg, referred to the sub-committee presided over by M. Pouillet.

Austria, Bulgaria, Albania and Lichtenstein, referred to the sub-committee presided over by Lord Robert Cecil.

Georgia, Armenia, Azerbaijan, Ukraine and Costa Rica, the sub-committee presided over by Dr. Fridtjof Nansen.

The committees will consider the following questions: Is its application in order? Is the government applying recognized *de jure* or *de facto*, and by which states? Is the applicant nation possessed of a stable government and settled frontiers? What are its size and population? Is it self-governing? What has been its conduct, including both acts and assurances, with regard to its international relations?

The last-named question is supposed to have been inspired by the French member of the committee, M. Viviani, with a view to any proposition that may be submitted to elect Germany.

INTERNATIONAL COURT.—While a majority of the commission on an International Court favored compulsory jurisdiction, the opposition of the British member led the commission for reasons of practical policy to accede to the previous decision of the League Council in favor of granting jurisdiction only in cases where both parties were willing. In view of the strong sentiment for compulsory jurisdiction, however, a proposal was made that nations might signify their acceptance of it, and that it should operate in cases between nations thus committed to the plan. The Council appointed a committee of ten jurists to complete definite plans for the organization of the court.

NO INTERNATIONAL CREDIT INSTITUTION.—The Committee on Finances and Economics decided that it would not act at present on the suggestion of the Brussels Financial Conference that a committee of financiers be chosen to lay plans for an international credit institution. The committee appears to be of the same opinion as the Council of the League that this is a question in which precipitate action would be unwise.

If the Assembly approves the committee's decision, another international financial conference will be held next year before anything is done on the suggestions made at the Brussels conference. This is understood to be the plan advocated by the British.

PLANS FOR DISARMAMENT.—On December 1 the League Council sent the following invitation to the United States to send a representative to take part in discussions of disarmament:

“To the Government of the United States:

“The Council of the League of Nations, acting on the unanimous recommendation of the permanent Military, Naval and Air Committee passed at a meeting at Geneva on November 25, invites the government of the United States to name a representative to sit on this committee in a consultative capacity during its study of the question of the reduction of armament, a study which the Council has asked the committee to undertake forthwith.”

This permanent Advisory Committee was constituted by the Council at its meeting in Rome, and held its first session at San Sebastian. It is composed of military, naval and air officers of the states represented on the Council. Its decisions are purely advisory and not in any sense binding, but they represent the commission's technical judgment as formulated by the experts of many countries.

It would, of course, be perfectly understood that the presence of Americans on the committee would not commit the United States Government with regard to the final report. Indeed, the report itself will not be more than a basis for consideration by the members of the Assembly of means for the reduction of armaments, which united action may enable it to achieve. Nevertheless, just as in Brussels, the presence of American representatives whose function was only to give and receive information was an important factor in the success of that conference, so the general consideration of disarmament will be greatly facilitated if the American Government can be represented at the sessions of the Advisory Committee.

The problem is one to which public opinion everywhere attaches the highest importance. It is needless to say that a reduction of armaments is necessary for the well-being of the world, and, unless relief can be found for the general economic situation by international cooperation to obtain a reduction of the taxation required to maintain armaments, it must become worse. The Council in sending this invitation cannot but hope that the American Government, especially in view of the past attitude of the country toward disarmament, will not refuse the proposed association with the government of the League in beginning the preliminary work necessary for ultimate success and in lending to the present effort its assistance, which can in no way encroach on its own perfect liberty of action.

To this invitation the American Department of State replied that since the United States was not a member of the League, it could not send a representative to take part even in a consultative capacity. On December 11 Senator Walsh introduced a resolution in the U. S. Senate proposing that the President be requested to appoint a delegate to the Disarmament Commission. The resolution was referred to the Committee on Foreign Relations.

Geneva, December 11.—Japan can not reduce her armaments as long as the United States is increasing hers, Viscount Kikujiro Ishii of the Japanese delegation declared at a meeting of the armaments committee of the League of Nations this afternoon when the question of disarmament was under discussion.

Disarmament in three stages is the substance of the recommendation the committee will make to the Assembly as the result of its deliberations. The first stage would be marked by an agreement among the powers to make no further increases in armaments.

The second stage of the recommended procedure is a gradual reduction in armaments.

The third stage would be that of general complete disarmament, except insofar as arms were needed for police purposes.

RELATION OF ASSEMBLY AND COUNCIL.—The Permanent Rules of the Assembly, adopted on November 30, provided among other things that the Assembly should meet each year on the first Monday in September. In a committee report on the relations of Council and Assembly, it was pointed out that the two bodies could not be regarded as upper and lower houses, or as legislative and executive bodies, but must rather be regarded as two instrumentalities without analogy in constitutional law.

The report then went on to review where each has jurisdiction. Various matters are placed under the League in the covenant, but the covenant does not always state whether the Council or the League is intended. In conclusion, the following views are presented:

"First, the Council and the Assembly are each invested in part with powers and duties, neither body has the jurisdiction to render a decision in a matter which is common to the other.

"Second, the Assembly has no power to reject or modify a decision which falls within the exclusive province of the Council. The same respect must also be shown by the Council for the decision of the Assembly.

"Third, under the covenant the representatives sitting in the Council and the Assembly render the decisions of their respective states and in rendering the decisions they have no standing except as such representatives.

"Fourth, the Council will present a report each year to the Assembly."

AMENDMENTS POSTPONED.—On December 1 the Assembly accepted a report of the Amendments Commission postponing discussion of changes in the League Covenant until the next session. On this question of procedure, Senor Pueyrredon, Argentine Premier and head of the Argentine delegation, voted in the negative, and afterward withdrew from the Assembly.

This action of the Argentine delegate created a sensation, and was taken by opponents of the League as significant of its inevitable and speedy dissolution. Senor Pueyrredon, however, declared himself a firm believer in the idea of a world league. The amendments which he wished to bring before the Assembly, and refusal to consider which caused him to withdraw, were designed to take the League out of the control of the victorious Allies. He proposed changes in the method of electing the Council, and another amendment providing that all states who did not remain outside of their own choice should be at once admitted to the League.

ATTACK ON ARTICLE X.—On December 4 one of the Canadian delegates moved to eliminate Article X from the League Covenant. Another Canadian delegate later spoke vigorously against the powers accorded to the various League bureaus, which would sit permanently in Europe and which non-European delegates could not easily attend. He objected to a League dominated by Europe. The discussion of Article X was postponed until the next session, with Canada's consent. The speech on the article was as follows:

"My motion should surprise no one," he said. "It is a continuance of the old fight made by the Canadian representatives at the Peace Confer-

ence against Article X. Their protests were vain. Afterward, when the covenant came before our Parliament, it was proposed to ratify it with a reservation on this point, but finally it was decided that Canada could do better work to get Article X removed from inside the League than by making an outside protest of this character at that time.

"I am sure that the United States will see the justice of the Canadian viewpoint. In point of fact, the article is nothing but a humbug. Every one knows that it cannot be enforced. We are opposed to it on principle. It is an endorsement of the territorial lines laid down in the Peace Treaty. It is also unfair.

"Canada, for instance, is like a man living in a fireproof house who is forced to take out an insurance policy like some one whose home is surrounded by kegs of gunpowder. If guarantees were necessary for the protection of nations less fortunately situated than ourselves, they might be supplied by the four big powers chiefly concerned, who are armed for the purpose sufficiently and whose interests are at stake."

REVIEW OF BOOKS

"Modern History of Warships." By William Hovgaard. (Published by Spon and Chamberlain, 120 Liberty Street, New York.)

This book is based on lectures given by Professor Hovgaard in his course in Naval Construction at the Massachusetts Institute of Technology. It is really a preliminary text-book, or an introduction, to his "Structural Design of Warships," for, as stated in the preface a historical study of the development of various types of war vessels is necessary before a student can properly appreciate the present state of the art of warship construction.

The book is the result of exhaustive search of official reports, the technical press, and other publications dealing with the characteristics of naval vessels, their performance, and service injuries in peace as well as war, and contains data chronologically arranged which is not to be found elsewhere in one publication. The period covered extends from the introduction of steam and iron for vessels, early in the nineteenth century, down down to the latest 1918-1919 types, starting with Fulton's *Demologos*, the first steam propelled warship, and carrying on through all the evolutions to the British *Hood* and our own *California* class. The comprehensiveness of the book is indicated by a chapter on aircraft, and by others dealing with the development of propulsive machinery, ordnance, and armor. There are numerous illustrations, principally diagrammatic or outline sketches to supplement the text which is far from being a compilation of names, characteristics, and dates. The author very aptly describes the book in saying it is intended "to give a critical discussion of the various types of warships, and to explain the causes—political, military, and technical—which have influenced and directed the evolution."

There are fourteen chapters of text, the first eight, comprising approximately three-fourths of the book, discuss the development of war craft of the several types; then five of a more technical character treating of the development of the design and construction of the hull, propulsive machinery, armament, mines, torpedoes, and armor; and a final chapter giving the author's conclusions as to the present state of the art and the trend of development in the "nearest future."

The development of warships is covered by chapters on armored battle-ships, cruisers, vessels of special type, gunboats, surface torpedo vessels, submarines, and aircraft. Each main subject is discussed at length for the navies of the large powers, Great Britain, United States, France, Italy, Germany, and Japan, with brief mention of minor navies. The causes of losses of ships and lessons learned from such fatalities are appropriately mentioned as are also the more important trial or experimental vessels. Among the most interesting and instructive parts of the book are the remarks on war experiences at the end of the chapters on battle cruisers, destroyers, submarines and aircraft.

The chapter on battleships is the most extensive in the book as is to be expected from the importance of the subject and on account of this type including many of the important features of others. The submarine chapter is specially interesting and covers not only the development of submarines, but also a discussion of their use in war. The five chapters on development of hull, machinery, armor, etc., do not cover the subjects as fully as has been done for the types of ships, but contain interesting historical data, and are well worth reading. While the book is best suited for students of Naval Construction it contains much material of value and interest to all connected with the naval profession. Those engaged in designing or determining the military characteristics of ships should have a general knowledge of the history of the development of the several types, should study the conditions met in service, should investigate results of damage in peace as well as that inflicted in war, and should be familiar with what has so far been accomplished and the future possibilities. A study of Professor Hovgaard's book will put one well on the way in acquiring the above mentioned information. It should be read by all officers of the Construction Corps, and by all others who are interested in the evolution and development of our fighting vessels. The author considers that his work will be useful, both in the study of naval construction and in that of military science. That this belief is well founded will undoubtedly be agreed upon by all its readers.

W. G. D.

"Balística Exterior Telemetría y Tiro Naval." By Manuel Vela and James Janer.

The work "Balística Exterior, Telemetría y Tiro Naval" is, it appears, the first work treating of this subject which has been published in Spanish. Such a work was necessary in order that naval officers of Spanish-speaking countries might solve the many problems presented by gunnery.

The well-known book "Artillería de Naval" by Hermida describes the matériel in use at the time of its publication and treats of exterior ballistics and of some gunnery problems; but it is now somewhat obsolete and whatever information a "man-of-war's man" required was to be found only in foreign works, the compilation and translation of which was an arduous task.

The book of the Senores Vela y Janer fills this need. The authors omit all description of ordnance material, explaining instead, at suitable length, the fundamental principles of gunnery, the verification of theories, the calculation of corrections, probabilities, etc.

In general, and for the treatment in one book of such problems as may present themselves to the officer, and as a study of ordnance for a midshipman, the work is more extensive than that of Alger, which is that used in the North American Navy. Nevertheless the authors of the work have translated several chapters from Alger's book and have followed in the development the same system as Alger.

The study which the authors make of the effect of rotation on the trajectories of long range and duration, the correction for the curvature of the same, and the similarity between the movement of the gyroscope and ogival projectiles, is interesting.

The authors also concern themselves with a study of the gunnery errors due to roll and pitch; of delays in firing, and of the corrections for the difference in the situation of range finder and gun; and in pages 190 to 192 they discuss the underwater velocities of projectiles.

In Part II there is an explanation of the method the authors use for the calculation of trajectories for large angles of elevation (anti-aircraft fire). In this part there is also a study of rifle fire.

The study made in Part III of range finding, range finder errors, method of adjustment, etc., is all as complete as could be given in a text-book, being sufficient to serve as a basis for the solution of any range finder problem.

Finally, in Parts IV and V there is studied the practical application of the fundamentals of gunnery in the cases of a fleet action, defense against destroyer attack, firing on a coast, fire with landing force guns, etc. There is discussed further the influence that atmospheric refraction exercises in limiting maximum gunnery ranges, height of the guns of their director stations, observation of fire, etc.

As an appendix a study is made of "curved fire" and of the constitution and principal characteristics of the explosives normally employed in naval artillery.

J. R.

"The Airplane." By Frederick Bedell.

In this book Dr. Bedell has explained in a simple, clear manner the fundamental problems of flight. Such a general treatment is probably of most value to the general reader who desires to know the engineering principles involved in an airplane, but is not interested in their detail application. The treatment is essentially non-mathematical and obviously avoids the more obscure relations and the results of more recent invention and research. The book can hardly be called superficial and the treatment within the limits the author sets himself is entirely sound. However, when mathematics is avoided those questions which cannot easily be explained by words and diagrams have to be omitted for the sake of clearness. In particular, the chapters on stability are rather thin, although a quantitative discussion is given of the various factors that affect stability.

The book discusses the general mechanics of flight and is not concerned with structural matters nor the construction of the various types of airplanes and seaplanes and their accessories and equipment.

In general, the book is an easy first course for a man who is curious about the principles of flight. The reader should not, however, conclude that the motion of an airplane is quite as simple and easily understood as Dr. Bedell's book. It is Dr. Bedell's skill in clear exposition which makes the subject seem easy, together with his caution in eliminating.

J. C. H.

"A Guide to the Military History of the World: War 1914-1918." By Thomas G. Frothingham, U. S. R. (Boston: Little Brown & Co.)

It is hard to conceive of a more difficult task than that which has been accomplished by the author in this one short volume. It is safe to say that any reader that is not gripped by the vigor and simplicity—the obvious fairness, the clear and concise method of handling material that has hitherto been bewilderingly confused, must give up hope of ever finding an easier or more delightful method of informing himself of the greatest period in the history of the world. This too in the face of the fact that the public has been fed up *ad nauseum* for the last six years with every form of war stuff from newspaper propaganda to official reports and biographies of the chief participants. And yet the net result has been hitherto only a mountainous mass of doubtful information that has apparently baffled every attempt to winnow out intelligible history. The labor of condensing a library into a single volume suggests a task greater than producing the library itself; yet the style is so easy and straightforward that we wonder why it was not done before. A clue to the author's method is found in the opening quotation, "The key to any mass of evidence is a narrative synopsis of the actual events." With this as a motto the author keeps right in mid-channel throughout and avoids all the rocks, shoals and hazards in the shape of non-essentials that would certainly lure aside anyone that had not his genius for steering a straight course.

It is the only book that we have seen that gives a clear and concise account of each phase of the war in its relation to the war as a whole.

An excellent feature is the original maps that fold out so that they may be studied in connection with the text. These maps are especially devised to show only the essentials and save time and temper that are often exhausted in groping through the wilderness of detail of the ordinary map.

For naval students the account of the Battle of Jutland will be found of unusual interest. It clears up many obscure points in this most confused of battles. The author has carefully analyzed and balanced the conflicting British and German accounts and at the same time has made the narrative so simple as to be intelligible even to a school boy.

This book is recommended to the public in general and to the student. The first because we all should be correctly informed of this great period through which we have lived and the second that the student may be properly oriented to take up intelligently the study of details now buried in official reports and technical papers. For this reason it seems especially adapted for use as a text book in schools and should be found in every public library. The events with which it deals are so recent that its unbiased historical perspective is as unexpected as it is refreshing.

It is our opinion that this book will live. Nothing short of a masterpiece could rise above the flood of war books that have appeared and it is not surprising that it should be acclaimed abroad as well as here because it is—masterly.

L. Mc. N.

"La Guerre Avec Le Sourire." By Captain Nemo.

Selected with great cleverness is his title "War with a Smile" it describes valuable service rendered by the Naval Brigade of 6000 men under Vice Admiral Ronarch during the early part of the World War and especially their obstinate and sturdy defences of Dixmude and their tenacity with which they clung to the left bank of the River Yser under conditions that try men's souls and break down the morale of the sturdiest troops. In his introduction he tells us "Smile, is for us, the French people, the talisman of the Arabian Knights, the palladium of the ancient citadel, the emblem of success and the gage of victory. Preserve the smile and you are sure to win."

He starts with the assembling of the brigade in Rochfort and when it is hurried to Paris to replace the Police Force already drawn to the front. After many wanderings it slowly but surely arrives at the front and is thrown into the breach to oppose the drive of the Germans in their attempt to reach the Channel. With a smile they cling to their positions on the Yser for 33 days meeting their steady losses and the continuous bombardment with a sturdy philosophy with which they were accustomed to meet the pounding sea and howling gale.

The book is interesting throughout and is a tribute to the brilliant service which the French Naval Brigade, under Vice Admiral Ronarch rendered on the Western front and one which sister services will read with great interest.

R. H. J.

"L'action Maritime Pendenat la Guerre Anti-Germanique." By Rear Admiral Daveluy.

Rear Admiral Daveluy has already contributed a book on the Naval Lessons of the World War. In the two volumes under review he cites the operations of the War in chronological order and separated on a geographical plan. As far as practicable with available material now at hand these various operations seem to be quite accurate. The first volume is given over to operations in the North Sea 1914-15, then the operations of 1916, and especially the Battle of Jutland, and finally the operations of 1918 in the Northern Waters. A review of the situation in the Mediterranean up to the intervention of Italy and the operations on the Dardanelles. In the second volume the operations continue in the Mediterranean and Adriatic after which the various minor operations in distant seas are discussed.

It is needless to comment on the style and clearness with which Admiral Daveluy brings out his facts. The descriptions are brief and omit unnecessary details in the various actions. Finally at the end of those actions which would seem to call for comment a brief opinion of errors and mistakes is added as seen from his point of view.

Altogether it is an excellent review of the war from the point of view of the recognized expert in the French Navy on strategy, tactics and administration. It may well be taken as representing the general French opinion concerning the Naval Operations of the War.

R. H. J.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

- (a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

- (b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

- (c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

- (d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,
Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- "Rebuilding the Navy's Enlisted Personnel, and Reestablishing Its Morale and Spirit After the Serious Slump Caused by too Rapid Demobilization and High Wages in Civil Life."
- "The Human Element in the Administration of Discipline."
- "A Demobilization Programme for the Future."
- "The Mission of the Naval Academy in the Molding of Character."
- "Health of Personnel in Relation to Morale."
- "Physical Factors in Efficiency."
- "The Naval Officer and the Civilian."
- "Naval Bases, Their Location, Number and Equipment."
- "Military Character."
- "The Ability to Handle Men a Necessary Element in the Equipment of a Naval Officer."
- "The Relation of Naval Communications to Naval Strategy."
- "The Relation of Naval Communications to Naval Tactics."
- "The Training of Communication Officers."
- "The Organization of a Naval Communication Service."
- "The Naval Policy of the United States."
- "A Review of the Battle of Jutland with Lessons to be Learned Therefrom."
- "Modification in the Design and Armament of Ships to Meet the New Conditions of Aerial and Subsurface Attack."
- "Coordination of Surface, Subsurface and Aerial Craft in Naval Warfare."
- "Our New Merchant Marine."
- "Submarine Warfare, Its History and Possible Development."
- "Escort and Defense of Oversea Military Expeditions."
- "A Proposed Building Programme for the U. S. Navy, Including an Efficiency Air Service."
- "Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation."
- "The Ship's Company—Its Training, Discipline and Contentment."
- "The Principles of Leadership of Naval Personnel."
- "Morale Building."
- "The Value of Facility in Exposition—Verbal and Written—for Naval Officers."
- "Discipline as Affected by the Human Relation."
- "The Value of Pep."
- "Navy Spirit—Its Value to the Service and to the Country."
- "The Influence of the Term of Enlistment on the Efficiency of the Service."
- "The Principles upon which Should be Founded the Freedom of Neutral Shipping on the High Seas."
- "The Fighting Fleet of the Future."
- "The Future of the Naval Officer's Profession."
- "The Navy: Its Past, Present and Future."
- "The Navy in Battle: Operations of Air, Surface and Underwater Craft."
- "Shall I Remain in the Navy?"
- "Psychology and Naval Efficiency."
- "The Naval Policy of the United States in the Light of the Peace Treaty."
- "Scope of Naval Industrial Activity and the Navy's Relation to Shore Industry."
- "The Pacific Theater."
- "Was Germany's Coast Impregnable?"
- "Future Development of the Naval Shore Establishment."
- "America as a Maritime Nation."
- "Arguments for and against the Restriction of the Manufacture of Munitions to Government Owned Factories."
- "The Present Rule of Neutrality regarding Contraband and Blockade—Is it Justifiable in Ethics or in Expediency?"
- "The United States Navy and the League of Nations."
- "Is a League of Nations Navy Desirable?"
- "The Adaptability of Oil Engines to all Classes of War Vessels."
- "The Place of Mines in Future Naval Warfare and the Rules under which Their Use Should be Allowed."
- "The Use and Abuse of the Doctrine of Continuous Voyage."
- "The Question of the Future Use of Submarines."

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents. All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

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611

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CONTENTS

THE WARFARE OF THE FUTURE. By Rear Admiral Bradley A. Fiske, U. S. Navy	157
SUGGESTIONS FOR IMPROVING NAVY MORALE. By Commander C. F. Russell, U. S. Navy.....	169
SQUANTUM, THE VICTORY PLANT. By Captain Reginald R. Belknap, U. S. Navy	177
GOOD STEERING. By Lieut. Commander A. M. R. Allen, U. S. Navy..	187
THE FATE OF THE DREADNOUGHT. By Lieut. Commander Guysbert B. Vroom, U. S. Navy, and William Oliver Stevens.....	191
POSITION PLOTTING BY RADIO EXPERTS. By Elmer B. Collins, Nautical Expert	201
UNDER-WATER TRAJECTORIES. By Alan S. Hawkesworth, F.R. S. A., Mathematician, Bureau of Ordnance	207
PERRY'S EXPEDITION TO JAPAN. By Mary H. Krout.....	215
AMALGAMATION. By Commander N. H. Goss, U. S. Navy.....	231
OPERATIONS ASHORE IN THE DOMINICAN REPUBLIC. By Major Edwin N. McClellan, U. S. M. C.....	235
DISCUSSION	247
SECRETARY'S NOTES	251
PROFESSIONAL NOTES	253
NOTES ON INTERNATIONAL AFFAIRS.....	288
REVIEW OF BOOKS	295
INFORMATION INDEX	252

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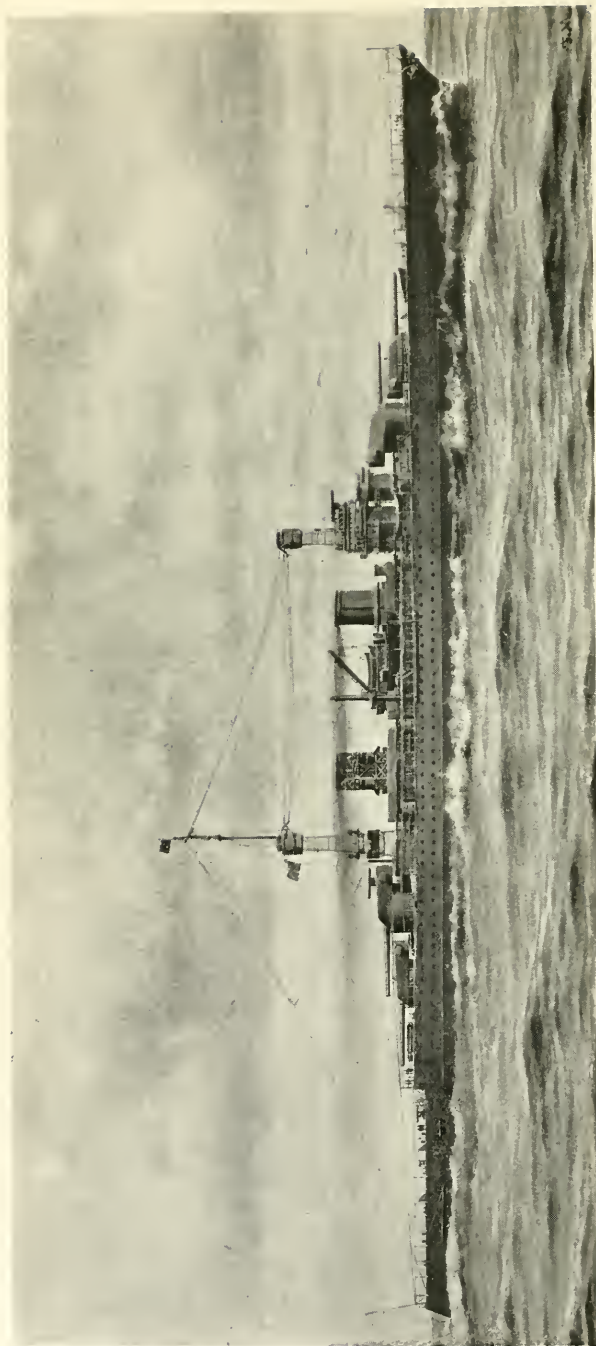
REAR ADMIRAL WM. T. SAMPSON, U. S. NAVY, OCT. 1898-OCT. 1902

REAR ADMIRAL H. C. TAYLOR, U. S. NAVY, OCT. 1902-OCT. 1904

REAR ADMIRAL C. F. GOODRICH, U. S. NAVY, OCT. 1904-OCT. 1909

REAR ADMIRAL RICHARD WAINWRIGHT, U. S. NAVY, OCT. 1909-OCT.

1911



U. S. BATTLE CRUISER LEXINGTON AND CLASS.

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THE WARFARE OF THE FUTURE

By REAR ADMIRAL BRADLEY A. FISKE, U. S. Navy

In a recent book, "The Art of Fighting," I endeavored to show how all warfare had developed gradually from primitive modes of fighting among primeval people; that it began with the use of man's natural weapons, his arms and fists, and changed gradually in character and methods, after changes in weapons had been made.

Exactly when the most important changes were made, we have no means of knowing; because they had all been made, and were in successful operation, before it was possible to record the facts: that is, before recorded history began. Recorded history shows to us that at a period about 1500 years B. C., the development of weapons and the development of methods of warfare for utilizing them had reached a very advanced stage. At this period, the original method of fighting with the fists and arms, had been supplanted for major operations by methods (including the use of cavalry) which employed highly specialized weapons such as spears, javelins, bow and arrows, swords, crossbows, catapults, balista, war chariots and battering rams; and had been answered by the use of shields, leggings, helmets, walls, ditches, entanglements, and armor made of cloth and hides and brass and steel.

War was then conducted almost wholly on the land; but it was conducted somewhat on the sea, especially in the eastern areas of

the Mediterranean. The solid log had been gradually developed into the hollowed log, then the built canoe, then the boat pulled by oars, then the boat in which the oars were supplemented by sails, and then the armed war-galley.

Warfare had become a highly developed art in Egypt in the 15th century B. C., in the days of Thutmose III, as is proved by the accounts of his 17 campaigns in Syria, prosecuted as they clearly were, with a high order of—not only courage and skill in operation—but wisdom, energy and foresight in preparation. In the year 1479 B. C., Thutmose, in capturing Megiddo, secured 924 chariots, 2238 horses and 200 suits of armor—a clear proof (if any proof were needed) that chariots, horses and armor were then actively used in war. Two years later, he instituted a campaign in which sailors as well as soldiers participated; for he transported his army by sea to the west coast of Syria, established a base there, and marched the soldiers thence into the interior.

Which people were the first to employ boats and other floating craft for use in war is not clearly established yet; but it is well known that long before the 15th century B. C., many large vessels sailed the Persian Gulf and the Eastern Mediterranean, carrying the wares of Assyrian, Babylonian, Persian, Egyptian and Phoenician merchants; and it is also well known that the Phoenicians were at one time the most enterprising and skilful of them all. They transported the wares of the rich inland countries east of them to the islands of Greece and the mainland of Italy beyond, even to the western limit of the Mediterranean; and they brought back many kinds of raw materials, such as tin, copper, lead, etc.

That armed vessels were used for war in those far distant days, there can be no doubt whatever; for drawings of armed galleys abound in the records of those times.

From those days until the invention and utilization of the gun in Europe in the middle ages, no very great change in the methods of war on land can now be discerned; and the same remark would be true, but in a lesser degree, concerning the weapons and the methods of war upon the sea. From the days of Thutmose III in the 15th century B. C., till the introduction of the gun in the 14th century A. D., men fought with virtually the same weapons, and therefore by virtually the same methods. And while it is probably true that the weapons and the methods were better in

Alexander's time than in that of Thutmose, and still better in Caesar's time, it seems almost sure that neither were so good at any time after the Fall of Rome, until the gun came into play.

But on the sea, a considerable development had slowly taken place. The main development that one would naturally look for would be in size; and increase in size had clearly taken place. It is not plain, however, that the increase was great: and so long as oars were the motive power, great increase could not reasonably be expected, because of the greater size and complexity of the organization needed, and the greater difficulty of turning a heavy vessel quickly in the emergencies that arose in battle. So long as the comparatively restricted waters of the Mediterranean were the scene of all the sea fighting that took place, oars continued to be the motive power used in battle; sail power being employed mainly as an auxiliary, as a means of resting the rowers, and in order to undertake long voyages. Rowers pulling oars supplied the motive power even as late as the battle of Lepanto in 1571, between the Turks on one side and the Christians under Don John of Austria on the other side. Even as late as the expedition of the Spanish Armada against England in 1588, many of the Spanish ships were propelled by oars as well as sails.

Both at Lepanto and at the subsequent battle of the Spanish Armada, powder guns were used: in fact, the gun and the ship itself used as a ram were the principal weapons: though considerable effect, of the original sea-fighting kind, was accomplished in both battles, running alongside and sending soldiers on board, to fight as soldiers against the soldiers of the enemy.

This reminds us that, from time as far away as the records of fighting go, *the office of the ship has been almost wholly to transport destructive power to a place where it could be used against an enemy.* At first, and for many centuries thereafter, the destructive power was merely that wielded by soldiers; first with their arrows and javelins before the ships came into contact, then with their swords after boarding had been effected. Ramming was carried out whenever it could be accomplished; and in ramming contests between fleets, the relative skill of the seamen in the opposing fleets was put to its fullest test, and bore its fullest fruit. But even if we attach the greatest possible value to the results of ramming, we must realize that the ram rather than the ship itself was the destructive agency, and that the office of the ship was

merely to transport it and to thrust it ; even as a warrior transported and thrust his spear.

The invention of the mariner's compass, the succeeding invention of the astrolabe and quadrant, the resulting ability of seamen to push their voyages out into the stormy and broad Atlantic, the consequent discovery of the route to the south tip of Africa, of America and of the Good Hope route to India, and the circumnavigation of the globe by Magellan's ship, the *Victory*, made the Mediterranean a minor area, and necessitated the building of ships of stronger frame and longer cruising radius than had before been needed. Then there soon came into being the sailing-man-of-war, which attained the climax of its power and usefulness in the days when Nelson and his "band of brothers" shattered the sea-power of the French, and blasted the ambitions of Napoleon.

The large sailing ship, moved by the wind alone, and armed with guns on each broadside, was the highest development of armed power that could then be used upon the sea. It was superior to the oar-rowed galley in cruising distance, but inferior in quickness of maneuver. Had the gun not been invented, one can only guess whether the oar would have continued the main motive power for warships. But the gun was so superior to the sword and the arrow, that it soon became the main offensive weapon of the ship ; and the power of sails to carry this weapon over great distances without pausing, resulted in the battleship of the line that ruled the seas for centuries.

But its rule was of brief duration compared with that of its immediate predecessor, the armed galley : for the galley was lord of all it surveyed for 30 centuries that we know of, while the armed sailing-ship reigned only from the closing days of the 16th century to the middle of the 19th century, a period of less than three centuries.

The sailing man-of-war supplanted the rowed armed-galley mainly *because it could transport destructive agencies more quickly over long distances* ; and the steam man-of-war supplanted the sailing man-of-war for precisely the same reason.

Meanwhile, between the time of utilization of the gun and the appearance of the steamship, on the sea, a similar though smaller development had been going on, on land. History does not tell us very clearly exactly when the gun was first employed, but we know that it was not long before or after the battle of Crécy in

1346, and that one of the first effects was to remove the knight in armor from the field of war; supplementing and making sure what had already been almost effected by the long bows and arrows of the archers.

Thus the utilization of certain inventions, especially the gun, removed the armed galley from warfare on the sea and the armored knight from warfare on the land. Both the armed galley and the armored knight had been the main factors in their respective fields for more than 3000 years. Nothing could have seemed more a permanent feature in any department of life than the armed galley and the armored knight; *yet both were cast aside like worn out gloves when more effective agencies appeared.*

That this should have been the case was clearly unavoidable, and that similar changes will again occur is also unavoidable, so long as wars, or even the possibility of wars, exist upon the earth. No other issues are so important as the issues of war, no other exactions are so imperious as the exactions of war. Diplomacy, statesmanship, society, religion, business—all make their demands, and sometimes harshly: but with each some compromise may be made, and from each some concession may be wrung—but war demands the best that nations can effect, with no compromise and no concession. When a nation goes to war, it must make its supremest effort; it must not compromise with mere conservatism, or make any concession to inertia.

But while the gun made a tremendous change in warfare, both on sea and land, the steam engine made a greater change, both directly and indirectly.

On the sea, its direct effect was to make the operations of ships so sure that their times of coming and going could be predicted and arranged with confidence, and also to accelerate the passage of ships over great ocean distances. Its indirect effects were almost countless; for the reason that the invention of the steam engine brought such an impetus to the study and invention of mechanical appliances of all kinds, that men-of-war were produced of a cruising radius, a degree of impenetrability, and a quickness and sureness of maneuver that had been undreamed of; and guns to be carried by these ships were built, and projectiles to be fired from those guns were forged, which with previous methods of manufacture had been impossible. The invention and utilization of the naval telescope-sight gave an accuracy to the firing of

those guns that justified making guns even larger yet, and consequently justified the construction of ships larger yet, to carry them; while the invention of range-finders and of optical and electrical appliances of many kinds gave an added touch of accuracy and speed, and justified still further advances in the size and power of ships.

It may here be pointed out that the value to any nation of its navy depends on the power which that navy can exert; and that the value to the civilized world of navies in general depends on the power they can exert, in comparison with that exerted by the uncivilized, the semi-civilized and barbarous. It may also be pointed out that, of all the various factors by which civilization is maintained and the beneficent results of civilization are spread throughout the world, no other single factor is more important than the safety with which vessels pass over the seas on their lawful occasions; a safety which is made possible by the navies, and by the navies only.

On the land, the main direct effect on warfare of the steam engine was to increase the speed with which troops could be moved, the first instance being in our Civil War. The indirect effects were many and various, and along the same lines as in warfare on the sea, but to a much less degree. The size, power and accuracy of guns were increased, but not so much as on the sea; and so of course, were the quickness and precision of their handling. The main arm of offence, however, remained the musket of the infantryman; and although the power and general effectiveness of this weapon were increased, they could not be increased to any great degree, because the weight of the musket could not be increased beyond that which a single man could carry on long marches. Even up to and throughout the Napoleonic times, the modes of fighting by armies were not very different from those in the days of the early Egyptian kings; because the main difference was that due to the superior range and penetrability of the gun, as compared with the javelin and the arrow; while the means of transportation and communication were virtually not changed at all.

On the sea, however, the modes of fighting were so different from those of the early Egyptian days, that very few points of similarity can be found. Instead of small galleys pulled along short distances and over little waves, relatively enormous vessels

were propelled by the wind along relatively enormous distances, and over relatively enormous waves; and instead of warriors who threw javelins over only a few feet, and wielded swords at close quarters, seamen fired heavy balls of iron from cannon, over hundreds of yards and at enormous velocity.

Thus we see that the effect of the progress of invention and civilization was to advance the later and more difficult art of sea warfare in a greater degree than the older and comparatively cruder art of land warfare.

That this might have been expected is apparent; for it is a matter of common knowledge that the progress of civilization has always been to build on itself rather than on nature; that the natural arts, such as agriculture, pasturing, writing, etc., have not been so much affected by invention and civilization as have the more artificial arts and modes of living. Life in cities, for instance, has been more changed than has life on farms; and the art of printing has been more changed than has the art of writing. Even amid the artificial surroundings of ship-life, we see greater changes brought about in the methods of fire-control than in the methods of sleeping and eating, and more changes in the mechanisms in the engineer and ordnance departments than in those of the galley and the store-room.

The result has been to endow navies with more destructive power than armies, and to give them ability to transport it at higher speed and over greater distances. To this, electricity has helped enormously, by contributing a means of rapid and sure communication which ensures the co-working of many ships and their effective handling as constituent units of great fleets. To such a degree of perfection has this been carried that, on the water, destructive forces aggregating more than the destructive forces exorable by millions of soldiers can be moved as units at great speeds, and turned to the right and left and rear, with a quickness and precision that cannot be even approximated on the land.

This accomplishment, however, has been only recently achieved. It was not achieved, moreover, until the sailing warship had wholly disappeared, and been replaced by the modern battleship; and it is instructive to realize that the going of the sailing warship and the coming of the modern battleship were strenuously resisted by the majority of navy officers. The fight did not really begin

until about 1880, and it was not actually ended before 1900. I was on duty in the Bureau of Ordnance from 1883 till 1885, and afterwards in the Atlanta, our first new fighting ship, and can bear personal witness to the bitterness of the fight that was waged to prevent the coming of what were called "mechanical gun carriages" and the abolition of sails. As late as February, 1897, most of the trip from San Francisco to Yokohama made by the U. S. S. *Petrel* was made under sail as well as steam.

It would surprise many of the present generation to know how stubbornly the change from the "old navy" to the "new navy" was resisted, and how bitterly some officers now rear-admirals on the retired list fought against it. As late as December, 1885, one of these officers, later the commander-in-chief of a fleet, argued with the present writer in the ward-room of the old Brooklyn that the Brooklyn was a better man-of-war than the Atlanta.

The coming of electricity was resisted in the same way; so was the telescope sight, the range-finder, the torpedo, and in fact, nine-in-ten of the methods and appliances that have increased the effectiveness of navies, and therefore increased the influence of navy officers in the world.

That the gradual abolition of the sailing warship should have been resisted may easily be understood, however; for it was the sailing warship that had built up the great prestige of navies. It was the sailing warship that had carried the flags of the great naval nations in all the seas, and that, under the command of Drake and Raleigh and Rodney and Howe and Nelson and John Paul Jones and Decatur and nearly all the great men of naval history, had put the navy officer on a plane only a little below that held by the army officer as the decider of the destinies of nations. The sailing warship had been queen of the ocean for three centuries, and she had reigned with power and glory and success. Why dethrone her and substitute instead a dirty tank of iron, filled with coal, and vomiting black, greasy smoke over the beautiful blue ocean and the beautiful white deck?


By an easily understood action (or inaction) of the mind, we unconsciously regard the present as the end of time, and unconsciously regard the appliances of the present as finalities. Nelson could not picture any warship except the kind he knew about—and the same remark is approximately true concerning some officers of a much later day. Even after our Civil War ended, as late as

1865, despite the fact that all the battles had been fought under steam, the majority of officers favored the retention of sails and resisted the coming of steam. Yet it was under steam that Farragut had achieved his victories, and put U. S. Navy officers in the front rank among the navy officers of the world.

But if the sailing warship had a reign of three centuries as a reason for believing her a finality, how much more of a reason had there been before, for believing that the war-galley was a finality! Instead of reigning for three centuries, she had reigned for 30: and a change would mean a change from the simple, orderly and trustworthy propulsion by oars, to a complicated, far-from-orderly and far-from-trustworthy means of propulsion by sails. One could always tell how long a time would be needed to propel a ship by oars from one place to another—whereas he could only guess, if sails were used instead. We are not told how much the question was debated during the long interval of transition; but (unless human nature then was not of the same kind that pervades the world at present) there must have been bitter opposition from many officers to the change. If the gun had not been invented, and the compass, astrolabe and sextant, it is possible that the Mediterranean would still be the naval battle ground and the war-galley the ship of war. But the progress of invention and discovery gave new means of exerting warlike power to ambitious nations, and compelled their navies to adopt them.

The power of armies and navies has now reached a tremendous stage of development; but some people are declaring that the soldier with his musket and the sailor with his ship are soon to be displaced by the airman with his torpedo and his bomb. This declaration is strongly resented by soldiers and sailors who declare—in effect—that the infantryman has always been the backbone of war on land and the battleship the backbone of war on the sea. To this the counter declaration is made that the infantryman and the battleship are perfectly free to remain the lords of their respective elements, but that both are soon to be reduced to “innocuous desuetude” by the warrior of the air.

Whether this declaration is to be proved true or not, only the future can decide. But, if we take careful note of the way in which the speed, power and safety of the air warrior are being increased, and call to mind the fate of the knight in armor, and the ensuing fate of the archer and all the other specialists who wielded weapons



and appliances that have been discarded; and if we call to mind the 30 centuries that the war-galley lived and the three glorious centuries of the sailing warship, and then realize where they are now, we can at least put our minds into a receptive state, and gage the future with instructed judgment.

The airmen tell us that two soldiers can carry two muskets with a few pounds of ounce bullets about 14 miles in a day: but that two airmen can carry a ton of TNT, 2000 miles in the same time; and they ask the nation to decide which pair of men it wishes to employ for its protection. They also say that a fleet of battleships, destroyers, train, etc., can steam—say 400 miles a day; but that 100 torpedoplanes can go a 100 miles an hour and discharge 100 torpedoes at that fleet repeatedly, from positions say one point on either bow, five miles distant where they cannot even be seen.

Of course, it is easy to question the truth of such declarations and to point out that no war has ever shown any such performances. But no war had ever shown such a performance as the gun achieved when it was brought to bear against the knight in armor. Neither had any gun ever achieved such a performance as the Prussian needle-gun achieved in the war with Austria, nor had any ship ever shown such an indifference to gun-fire as the *Monitor* showed at Newport News—an indifference to gun-fire that did in fact “revolutionize naval warfare.” Nobody—not even the German Navy officers—expected the submarine to show the effectiveness it showed in the great World War; and certainly the Belgians did not expect to see the tops of their vaunted forts crumble under artillery-fire. The effectiveness of poison-gas astonished the world, and so did the speed and certainty of our rush to Europe’s rescue.

“We live in an era of change” has been a standard remark for years, but a remark only, and not a realized belief. Yet it is a fact; and therefore we are foolish if we fail to realize it and make our decisions in accordance with it. In order to realize it advantageously, *we must foresee changes coming before they actually have arrived*: otherwise, we shall be like the Austrians who went down before the Prussian needle-gun at Königratz.

Because of the oft-proved value of not only being wise, but of being wise before it is too late, and because of the enormous expenditure of money and energy now being put into the development of naval aeronautics by the nation which had hitherto devoted

her main effort to the development of her floating navy, it might be well for us to consider the propriety of following in her steps. In order to clear our minds so that we may reach a wise decision, let us first realize that we have not yet reached the end of time, and that possibly the battleship is not an absolute finality. It is easy to fall into the prevailing habit of unconsciously believing that history has ended, simply because we cannot see ahead; but reason tells us clearly that history will narrate achievements, which will be accomplished long after we are dead; that history will continue to repeat itself in the main essentials of human conduct; and that in each generation, that nation will take the lead which, while giving due heed to the triumphs of the past, learns from them the most intelligently and the most quickly how to achieve the triumphs of the future.

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SUGGESTIONS FOR IMPROVING NAVY MORALE

By COMMANDER C. F. RUSSELL, U. S. Navy

Recently a young man was asked why he didn't enlist in the navy. He said: "I don't want to go into that outfit. There are too many bosses and, besides, you get your head knocked off if you don't salute." After further conversation it was found that his information had been obtained from a former service man with a fancied grievance. At different times I have had occasion to conduct similar conversations. I have found that many young men either have a bad opinion of the navy or else don't know anything about it.

Information of a favorable nature from ex-service men seems to be lacking. Yet it is believed that a great majority of the enlisted men of the navy are really fond of the service and feel that they get a square deal on board ship. The answer then is simply this. Contented men don't talk. If a man is not a knocker he keeps still. Thus a very small minority of disgruntled men are able to sway public opinion because their arguments are not refuted. Most prospective recruits are familiar with navy recruiting propaganda. But it may lack the ring of truth to them because their ex-service acquaintances have not verified the statements contained in this literature.

It is assumed that a great majority of enlisted men like the naval service, that they feel they are well cared for and are given plenty of help when they show any desire to improve themselves. As to the truth of this assumption, the reader can best judge from his own experience. From my experience, I believe the assumption to be true. The question might be asked, "Why can't the garrulously inclined be navy boosters instead of grumblers?" A professor of psychology will have to answer that. However, it is not believed that a contented man in any line of endeavor is inclined

to talk about his work. With satisfaction goes a veil of silence. Actions are said to speak louder than words, but this maxim holds only to those who can see the actions. So while the important message of a really contented navy is being sent by visual signalling, the message of discontent is being broadcasted by radio.

There are at least two ways to meet this situation. One is by converting the knockers into boosters. Another is by lifting the veil of silence from the contented. If the knockers could be converted, our problem would be solved. Past experience has proved that this conversion cannot be accomplished completely. Earnest effort will undoubtedly be fruitful in reducing the numbers of the disgruntled.

It is impossible to enumerate all of the kicks presented by the soreheads. They range all the way from finding hairs in the stew to a chronic objection to work of any kind. There is a type of man that refuses to recognize the good in anything whatsoever. He is vocally opposed to all law and order. When he can secure a small audience, he is happy, for in reality he is at heart in love with the sound of his voice and finds much personal satisfaction in being listened to. To him, what he says is unimportant, but he finds that his circle of listeners is larger if he is against the established order of things. In his way he craves publicity exactly the same as does the long-haired soap box expounder of things anarchistic.

The means best suited to discrediting and converting this type are hard to suggest. Such a man dislikes most of all to be taken as a joke, or in other words to be shown up for what he really is. On the other hand, tactful and sympathetic advice and help might convert his talent for talking into constructive instead of destructive channels.

Most men who are trouble makers, have personal grievances. They probably will complain about everything under heaven except the real cause of their discontentment. But the underlying cause is that someone senior to them has done them a fancied or real wrong. Men think that there is no way in which they can get justice in a case of this kind, that their word is no good against that of the man higher up. Few men that I have questioned have heard of such a thing as a redress of wrongs. They can't understand why they should obey the order or carry out the instruction before objecting to it. If the order is given, in what seems to them to be improper or abusive language, they think that their only way of

getting even is by taking the law into their own hands. The result is of course inevitable.

Frequent instruction in the fundamental principles of military discipline with clear explanation as to the necessity for it and the beneficial effects of it would clear up this condition. This might require some study on the part of the instructors. I am sure every one has heard discipline repeatedly defined as "An absolutely necessary thing for a military organization," or, "discipline is that (thing) without which no military organization can exist." In each case discipline is an awe inspiring and profoundly mysterious *thing*. Yet we merely use the word discipline to mean "a development of the faculties by physical, mental, and moral training." Couple that definition with well defined and thoroughly enforced law and the ground work is complete for understandable instruction on discipline.

Another line of discontent is made manifest by the obvious disinclination of men to salute their seniors. A man will sometimes deliberately turn away to avoid saluting, but just as often he will stare at the senior he is passing and still make no move to salute. In a case of this kind the senior is supposed to call the junior's attention to his failure to salute. Generally the senior cannot do this. Occasionally, however, a case is so glaring that the senior does question the meaning of the apparent slight. The junior then trumps up some excuse and feels hurt and sore and puts down the senior as a stickler for military form or something else which means the same to the man but sounds different when spoken. Action of this sort taken in public produces a bad impression on the inevitable circle of listeners.

The whole trouble here is the fact that the men are not properly instructed in the meaning of the salute. They are merely shown how to do it and they don't see any use for it except possibly as a public admission of their own subordinate position. In private life they call out greetings to friends or fellow workers whenever they come within hailing distance. Why can't they do the same by the prescribed method in the service when they pass a senior? Because they don't know that the salute is a form of greeting or salutation. They don't know that it is just as dignified to salute as it is to return a salute. It is an easy matter to make sure that every man in the navy thoroughly understands the true meaning of the salute. But

it cannot be done by publishing an order only. There must be personal instruction on this subject.

Many other instances of discontentment could be recited, the significant feature of each one being that it gives almost inexhaustible material for conversation by the loquacious sea lawyer. This is a much used term but when one stops to think about it one is struck by the fact that very seldom others than members of that society use it.

Another outstanding fact is that most cases of discontentment are due to ignorance or misunderstanding. Proper instruction will eliminate the one. Tactful discussion and explanation will correct the other.

In trying to break the silence that surrounds the contented majority, we have to use the same methods but in a different way. We use the same words set to different music. If some of the successful men of the navy could be persuaded to tell their friends on the outside of the navy's advantages and opportunities, some good could be accomplished. If all of this class of men would do this it is thought that a very favorable impression would be made on the vast reservoir of recruiting material in the country. It must be borne in mind that the young men that compose this raw material are gradually changing. They are slowly but surely getting a higher degree of education. This broadens their view on life and tends to make them more critical of any new work. They like to hear what their friends in the service think about it and if what they hear is favorable they might be inclined to look into it more thoroughly as a possible opening for themselves. Ex-service men, hearing favorable reports, would think about re-enlisting or at least would give out favorable accounts of their experiences in the navy. No man would do this unless privately urged to, and even then the feeling that he shouldn't write letters that might be published would be a further obstacle.

The navy regulations forbid the publication of any article or news item by any person in the service without the authority of the Navy Department. It is, however, an easy matter to obtain permission to publish any article that doesn't disclose military secrets or information, and that is not devoted to destructive criticism. Experience of the past has demonstrated the necessity of this official restriction on wholesale news items and letters to the public. This past experience is exactly the kind that has been discussed in

this article. Without restriction only the disgruntled would write for publication or else unconsciously the article would contain destructive criticism or information of a confidential military nature. If, in the past, there had been published more favorable articles and less of the other kind it might not have been necessary to muzzle the service. It is also thought that if the service should demonstrate by future action that for every knocker there are ten boosters for the navy, that it might be possible to modify the restrictive regulations and make it somewhat easier to present the interesting every day life and work of the navy to the public.

Besides letters which reach the interior of the country, there is the vastly easier way of reaching those close at hand by word of mouth. Every day while in port, thousands of our men go on liberty. Of these thousands nine out of every ten are potential boosters, and these men meet numbers of civilians every day. At present the one man out of every ten with the gift of gab and the poisoned tongue gets in his work while the other nine sit around, and, by their silence, apparently approve of his criticisms. This talk is adroitly disguised under a friendly or even fatherly cloak of tolerance of things that are not quite right. If closely followed his subject is found to be very much restricted because after all there are probably nine times as many things done right as there are things done wrong in the service. Right at this point if the nine listeners would thaw out and put forth the fine things about the service, their arguments would overwhelm the knocker. This is something that can easily be accomplished. It merely requires proper personal instruction to the men concerned.

Besides the letter propaganda and the personal touch with civilians that could be developed, there is one more phase of this side of the question. That is, the idea of taking steps to boost from within. As young apprentices graduate from our training schools and go on board ship they are still very far from being old timers. We all know the old song—"I knew he was a sailor for he wore a sailor's hat." The wearing of the uniform is usually proof to the civilian that a man is a sailor. But the wearing of a uniform doesn't change a man much, if any, at first unless we take into account the fact that he is usually more awkward and ill at ease than he would be in civilian clothes. The change comes from what he sees and hears. At drill and in his instruction periods he sees and hears things that eventually make him a trained and useful

cog in the human machinery of the ship. Outside of drill he sees and hears many curious things. Most of all he hears the language of men that are living an unnatural life. There are none of the restrictions of home and the refining influence of the ladies. Under such conditions the word "purity" in the phrase "The purity of our mother tongue" might be changed to "putridity."

Every person in the service is familiar with the verbal weeds that flourish and choke out the struggling crop of adjectives in the language. One is tempted to say "Oh Emphasis! What crimes are committed in thy name!" No one will tolerate any dirt or rust anywhere on board ship. It is fought tooth and nail all the time and is never allowed to get even the least foot-hold. The whole ship's company is engaged a generous portion of each day to maintain cleanliness of ship and person. We are prone to leave the fight on the dirt and filth in the men's vocabulary to an occasional chaplain. The Chaplain's Corps is not anywhere near large enough to make any impression on this problem. They need the help of every responsible man and officer in the service. Even then progress will be slow. But it is a fact that this looseness of language has a certain deteriorating effect on the morals of a man, especially the young man just starting out in the service. Now, if in addition to hearing decent language, the young man could hear the deserved praise of navy life and the opportunities before him, he would undoubtedly be started on the right track, the road to knowledge and resultant promotion. It is up to the satisfied older men of the service to accomplish this and it can be done.

Amongst the older satisfied men of the service are, of course, included the officers. A naval officer may be a rather peculiar human being, but he has in general the same characteristics as has the enlisted man. Naval officers as a rule love their profession. Take an officer away from the sea for any length of time and he will become uneasy. As time goes on he will long for his old life. He has the love of sea life bred in him. Take an officer in conversation with civilians and you will find a man extremely jealous of the honor of his service. He will stoutly defend the service from any attack or disparagement. But once you get a group of officers alone together in wardroom or elsewhere, you will almost invariably hear a long list of gloomy complaints. Talk of resigning and struggling for existence on the outside are heard. But most all of the listeners are perfectly sure that the sad faced officer con-

cerned has no more idea of resigning than he has of meeting the man in the moon. He is merely providing a form of entertainment for himself and friends. They all get a sort of solemn enjoyment out of it.

Officers generally take a keen professional interest in the enlisted men. All drills and instructions are carried out with the utmost exactness for detail and with the greatest patience. The spirit of competition is highly developed. The same interest is taken in sports and in healthful amusements. No one in civil life is anywhere near as well looked out for as is the service man when it comes to training and sports. Why not go just a step farther and say to the enlisted man "If you like the service tell your friends about it. If you don't like it let's talk it over."

Different officers use different methods in educating and training the men under their immediate command. But the ones that are most successful have as their objective the winning of the respect and confidence of the man. This cannot be done by giving privileges, being easy going, allowing the men to get into sloppy habits or otherwise trying to impress them that you are a good fellow. This method has the opposite result. The men develop a feeling of contempt instead of respect for the one employing such methods and no one will confide in a person held in contempt.

The respect and confidence of a man can best be won by firm discipline, absolute squareness in facing every problem, coupled with instant and full recognition of good and faithful service. Keep a man on his toes and give him a square deal and he will be on the alert to earn praise and promotion. Co-operation and well-directed action on the part of the officers will produce the goods.

But, first of all, let us see if we can't improve the officers in some respects so that they may set a better example and be better equipped to train the men entrusted to their care. There is room for improvement, we must admit, especially amongst the younger officers in neatness of person and in respect toward their seniors and in smartness of bearing. There is a tendency now noticeable among the junior officers to relax a little. They seem to lack the quality of alert respect in the presence of seniors. Some seem to have forgotten that it is a mark of manly and courteous respect to salute a senior. Alas! some evidently don't know how to salute. This is all a result of the war. It all can be corrected if the older

officers will but get together and see that all their junior officers are most thoroughly instructed in military bearing and courtesy.

We must bear in mind that at present a large percentage of our commissioned officers have not had the early military training that the Naval Academy graduates have. However, they are willing and anxious to learn how to become more efficient in their chosen profession. If the men are slack, the officers are entirely to blame. If the junior officers are slack it is the fault of the seniors. How easy it will be to correct all these defects. We have but to pull together.

There once was in Scotland a church located in a valley. The congregation decided, for some reason, that they wanted to move that church up on the nearby hill. So they got a great long rope and put it around the church. They put the church on rollers. They then led out the rope directly up the hill. The pastor was placed at the bitter end of the rope with a loop around his waist. All hands then manned the rope and at the word all started pulling together. At once the church began moving steadily up the hill. As they went along the pastor felt the church move more and more slowly. He resolutely set his back to the job and pulled all the harder. But in spite of all his efforts the church finally came to a complete rest. Covered with perspiration and filled with chagrin he turned his head and looked around. Consider his amazement when he discovered that not only were there no persons left on the rope but that all the congregation had climbed into the pews of the church and half of them were asleep.

Let us lend every encouragement to our superior officers to put the navy on the pinnacle of contentment and efficiency. Then let us all man the drags and pull and push and boost without let up until the navy we love is not only on the pinnacle of efficiency and contentment but is so firmly placed on the rock foundation of loyalty and co-operation that no matter what storm may beat on this our beloved service, it cannot fall because it is founded upon a rock.

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SQUANTUM, THE VICTORY PLANT

By CAPTAIN REGINALD R. BELKNAP, U. S. Navy

PART I

To the service at large, Squantum was first introduced by Captain Henry Williams (C. C.) writing in the April, 1920, number of the U. S. NAVAL INSTITUTE PROCEEDINGS, "A Record in Destroyer Construction," dealing mainly with the building history of the destroyer *Reid*, 59 calendar days from keel laying to delivery, tried and complete. To appreciate that achievement, the whole account should be read, for it shows a remarkable example of planning and management, but although, as a single destroyer building record, it is believed never to have been equaled, it does not stand as the only mark to Squantum's credit, nor the only ground for naval interest, historical and future.

The Squantum site in October, 1917, was a 730-acre tract, comprising 120-odd acres of solid, dry upland, the rest marshland and tidal flats, the whole lying along the Neponset River and Dorchester Bay, about 3 miles southwest from President Roads, Boston Harbor. Bleak, remote, and isolated, it yet had a not inconsiderable history. The name came from Squanto or Squante, an unusually intelligent and capable friendly Indian well known to the early settlers. Old resident neighbors tell of the fine crops grown in past years where now are the shipbuilding ways and the baseball field. On the edge of one attractive spot, looking across the Neponset River to Lawley's Yacht Building Yard, are the ruins of an old powder mill. Long a favorite resort for outing parties, a real estate boom brought to "New Squantum" a score or more summer cottagers, as well as a few substantial houses of well-to-do people, but the place lost these with its growth in popularity with an element inclined to be rough. There was a Squantum sporting club, and the ruined foundation is pointed out

of the house where John L. Sullivan lived with his trainer Muldoon, while preparing for the fight with Kilrain. Aviation began here in Grahame-White's time and was our navy's first war activity on this ground.

Between breaking ground for the new destroyer-building plant, October 6, 1917—cows still grazing on the site—and the cessation of work, February 14, 1920, a period of 28 months, 35 destroyers were built, of which 33 were delivered complete and the other two were transferred to Fore River within a month's work of completion—and this in spite of two winters of extreme severity. The first destroyer, U. S. S. *Delphy*, was launched on July 18, 1918, and on November 30 was delivered to the government. The incentive of a state of war thereafter was lacking, yet the work kept on in the same enterprising spirit as it had begun. Experience with the plant and its organization made progress more and more rapid, so that by the second anniversary, October, 1919, all 35 keels had been laid, 29 destroyers launched, and 22 delivered. The record feat in building the *Reid* was made at the peak of production, when 17 launchings, 36 builder's trials, 28 official trials, and 22 deliveries took place within six months. The average¹ building time of the destroyers here was about $7\frac{1}{2}$ months, which was less than done anywhere else and in marked contrast to the pre-war average of about 18 months.

The opportunity to plan a modern installation free from the embarrassments of already existing equipment or restricted area was evidently appreciated and utilized. The Squantum plant is compact without being crowded, so arranged as to avoid crossing of lines, carrying back, or other interference or lost motion in the movement of material. Traveling cranes and tracks communicate everywhere, and every operation of hull assembly, after launching as well as before, is done under cover. What could be more complete, more secure from delays of bad weather?

Since the boilers and machinery of the Squantum destroyers were built elsewhere, the engineering side of the new plant was

¹ All 35 averaged 8 months 20 days, but long delay in receipt of material and the plant being incomplete for the first 10, to neglect those makes a fairer average, namely, $7\frac{1}{2}$ months. The last 17 averaged $3\frac{1}{2}$ months before launching. In its present condition the plant could reopen upon order and, barring abnormal delay in the receipt of material, deliver 16 to 20 destroyers in 12 months and one a week thereafter.

at first comparatively limited. More engineering equipment was installed as the work progressed, and it became clear that finishing, fitting, adjustments, and replacements could be done to best advantage on the ground. The plant to-day is nearly as complete in machinery division equipment as it is for hull construction, the principal lack being tools and equipment for turbine work.

Many plant extensions and other war time constructions, aggregating in cost many millions, became of no further use to the government after the Armistice and had to be dismantled or sold. At Squantum, however, the prospect of future naval usefulness was favored by two important considerations. The plant was not adaptable for mercantile ship construction, which decided the Bethlehem Shipbuilding Corporation not to absorb it, and its location had happily been so chosen as to be suitable for a torpedo vessel base.

A board of naval officers, convened early in 1919 to consider the development of the shore establishment to meet future naval requirements, recommended Squantum for a building, repair, and reserve base of large capacity for destroyers, submarines, and possibly other craft of similar dimensions, and this mission was confirmed in general terms by the Secretary of the Navy on April 2, 1920, in G. O. No. 525, which designated this plant as the "U. S. Destroyer and Submarine Base, Squantum, Massachusetts," effective upon its "taking over by the navy. After the closing of work, in February, 1920, the business of assessing costs, appraising, stock taking, cleaning up and general restoration, was well enough along by June 1, 1920, for the plant to pass into naval custody on that date. For the present it is administered as an annex to the Boston Navy Yard under its own commanding officer.

Against odds Squantum made a record long to stand, of which all connected with the establishment may well be proud. The plant's locally popular name and its connections—Victory Plant, Victory Road, Victory Bridge—denote the spirit which, let us hope, may always be the characteristic tradition. Like a thoroughbred, Squantum having run one race is fit for the track again, and so ends the first chapter. The next opens with a great opportunity.

PART II

Ships, like weapons, if they are to be serviceable, must be well kept, whether in use or idle, and this applies most forcibly to the

finer mechanisms. Few will question the wisdom of giving priority to capital ships in all things—maintenance, upkeep, repairs, personnel, and training—for unless the main stem be sound and vigorous its branches cannot long endure. But though they come first they are not the only essentials, and could any demonstration be plainer than the late war, of the value of the branches towards preserving the stem? The very terms battleship, capital forces, and fighting fleet becloud the teaching of every great war, that it is the so-called secondary forces which carry on and bear the brunt of the long argument, and that, when at length there comes a test of heavy strength, the result will be much influenced by the past and present performances of the minor craft. The tendency of naval warfare seems towards increasing the proportion of the small vessels to the large, and unless their material needs be met, bitter experience is sure to follow in capital operations, through the breakdown or poor performance of flying, torpedo, escorting, patrolling, or sweeping vessels slackly cared for.

It takes some time after mobilization before the crews—invariably inexperienced—can get the many additional small vessels now required well enough in hand for reliable upkeep. Vessels taken in from outside may or may not be ready for naval activity without repairs. That is a matter beyond naval control in peace. But it would seem to be only prudent and economical to make commensurate provision for the continuous reliable upkeep of all naval craft, small as well as large, whether active or reserve. Modern mobilization is swift, especially with naval forces, and to accept or wink at any sure cause of delay is to court initial heavy loss if not defeat.

Whatever may have been the sufficiency of our dockyard facilities for our whole fleet in the first decade since the war with Spain, the dreadnaught era threw much out of balance, which is long in being restored. For ships of to-day the formerly sufficient berths, water frontage, depths, and docks have relatively shrunk. Ours was not the only navy so to suffer, as we have Lord Jellicoe's statement that British facilities too were out of adjustment. Leviathans demand large space and facilities, to meet which small needs have been crowded out, to find satisfaction elsewhere. Whether our repair and docking facilities for destroyers and submarines have kept pace with their numbers, recently much in-

creased, is a question to which all such vessels give the same answer.

That the facilities for small vessels should be equal to their needs will not be contested. If not sufficient, a number of destroyers, submarines, and others will soon become unfit for service unless extensively repaired and their cost will have been wasted or vastly increased. On the other hand, if the cost of one or two destroyers or submarines would provide facilities for keeping a large number ready for immediate and prolonged service, such outlay would indeed be well spent, yielding a large return in the serviceability of many vessels.

In the year 1907, in a round of visits preparatory to going to duty as a naval attache, I saw at the Norfolk Navy Yard an early stage of what our destroyer force at that time hoped would become before too long a reasonably well equipped base for torpedo vessels. Seagoing fashion, they were doing their best to make something out of nothing and, starting with an old pipe-bench salvaged from the scrap heap, they had made a fair show of a beginning. Commander I. V. Gillis was the presiding genius, then a lieutenant in command of the old cruiser *Atlanta*, used as a torpedo-boat tender, moored on the St. Helena side of the Elizabeth River. A very cheerful, confident, self-reliant atmosphere prevailed there. The torpedo boat people were happy to have a place they could feel was their own, where they could stretch their legs, use a few shop tools, and carry out their ship's force work without interruptions, such as the shifting of berths so frequently necessary when their lot cast them in among the big ships in the navy yard proper. Yet the outside observer could not fail to see that, except for their hopes, the establishment was meagre indeed.

From various sources it would appear that in more than one foreign navy more symmetrical provision had been made than by us for the care of small as well as large vessels, especially in regard to the kind of arrangements which our destroyer people were striving for with such persistence, namely: a place set apart where their needs had first consideration and undivided attention, where all facilities were for their use only, including separate berthing, ample and convenient storage, shops for ships' force work, barracks for crews not quartered on board, and recreation facilities for all.

No navy has kept or will keep its entire strength always in full commission, and the considerable number of torpedo vessels, as well as others, not in full commission need special provision for their upkeep. While their navy yard repairs are going on, it is comparatively unimportant whether the vessels' complements be full or much reduced, provided the repairs be done expeditiously so as not to prolong unduly the interruption of routine upkeep. Whether such repairs can be done satisfactorily along with work on other ships at navy yards, or to better advantage in a separate division of a navy yard or in a separate yard devoted to the specialties of destroyers and submarines, is not the subject of discussion here. The main consideration in this respect is that the repairs should be timely, adequate, and quickly accomplished.

During the considerable periods between navy yard overhauls, torpedo vessels which are too slimly manned to operate or which are able to operate singly in a limited way by being grouped and each in turn taking the partial crews of all in the groups, need better than improvised arrangements for their upkeep, if they are to be counted on for immediate readiness for active service. Water, steam, and light should be furnished them from an outside source, for the more the reduced crews can be relieved of auxiliary watch duty, freed from disarrangement of their routine, and allowed the use of such upkeep equipment as they do not themselves carry, the more certain of attainment will be the desired result.

The atmosphere of a large general repair yard is unfavorable for vessels in such a reserve condition. A special place apart is wanted, for which Squantum offers an exceptional opportunity. Without impairing its present facilities for building and repair or hindering the further development of the latter or the full utilization of both, if so decided, all the requirements for a reserve base for destroyers and submarines already exist in part or may be completed with small outlay—berths, shops, ships' storehouses, torpedo storage, quarters for submarine personnel, recreation spaces, good outside connections.

A great advantage of the Squantum property is that, in addition to its excellent equipment for building destroyers—easily adaptable for building fleet or smaller submarines and destroyer leaders as well, up to a length of 450 feet—other naval activities also may be placed here without interfering with full utilization of the

first mentioned or with one another. Thus, of aviation Squantum has seen more than a little, and was used for that purpose by the navy in our first few months in the war. The adjacent waters are sheltered but wide, and about 1000 feet of water front is still adaptable, so that local naval aviation could well have headquarters here. Then, Squantum has been designated as the depositary for all Atlantic Coast mine-sweeping gear, and a glance at the chart shows how favorable this situation is for a base for all mine-sweeping craft operating from Boston. The large acreage also offers ample space in a proper location for fuel storage. As a whole, there is so much area disposable that, while one or more of these three uses may come in the future, all of them together would not interfere with having the base affairs of destroyers and submarines in large number as the principal business at Squantum, for which it is best suited.

Estimates have been submitted embodying the main features common to the plans of all boards that have passed upon Squantum, which would provide first, among other things:

(a) Berthing 60-odd torpedo vessels.

(b) Dredging to a depth sufficient for the largest torpedo vessels to lie clear at lowest tide.

(c) Quarters for the complements of submarines.

The proposed beginning would utilize the existing facilities of the plant; make no expenditure on temporary structures except for necessary use pending their permanent replacement; proceed in such order as to interfere least with early beginning and future progress; avoid the probability of future changes by adhering to the broad outlines of a comprehensive plan; and as far as consistent with the foregoing, take advantage of natural features of the ground and site. Assuming the present estimates to be accepted, future improvements would simply add storehouses and enlarge the berthing and quarters capacity, since the proposed beginning, at outlay little more than the cost of one destroyer, would make the base equipment practically complete, and still of capacity to care for more vessels than could be berthed at one time.

Squantum is distant from President Roads $2\frac{1}{2}$ miles by a nearly straight channel, and it lies so detached from its surroundings that undesirable haunts seem hardly likely to cluster around. The



property as it now stands divides itself naturally into five main parts:

The industrial area, *A*, is sufficient for a large expansion, such as would permit the work of building, repairing, and keeping vessels in reserve to go on simultaneously without mutual interference. The natural direction of any further expansion beyond the present Dorchester Bay water front would seem to be along Neponset River, over the area marked *B*, lying south of Victory Road. Still more land and more water front on Dorchester Bay could be made, if needed, however, by dredging and filling in to the eastward of the building slips. Thus the shop and storage growth and increase of berthing space would naturally first cover area *A* (possibly with its extension eastward), then area *B*.

On the foregoing it follows that area *C* lies clear of the natural direction of the industrial growth, yet near enough to the water front and to outside connections to be a suitable location for quarters for the personnel of submarines, and of some destroyers also when necessary.

For recreation, the area *D* lies outside the ground natural for industrial plant extension, yet central for men's quarters in area *C*, for vessels' crews on the water front, and for connections to outside. Part of this area is already prepared for baseball. It has a swimming beach, there are a few trees, the outlook is pleasing, and the spot is generally attractive, long used for outings in the past. It invites use and improvement for such a purpose.

The southernmost section, *E*, sufficiently out of the way for privacy yet near enough for easy access and being a natural building site, would be advantageous for quarters for the commanding officer and other principal officers of the base. It has near access to the main highway, Quincy Boulevard, and over a direct roadway to the plant, along the existing railway line, it would be only 1300 yards from the office building.

Thus ample space and orderly, logical arrangement seem natural here, offering unusual opportunity for material development of high efficiency and along with it due provision for the human element, now gaining in recognition of its importance for military success.

A recent visitor at Squantum, an experienced British shipbuilder, remarked, "This is a wonderful plant, the best arranged and most complete anywhere, but I find it equally remarkable that they

propose to close it." Other visitors, from shipyards on both coasts, have spoken in similar vein. Likewise naval officers are most favorably impressed. They find the plant to be of far greater magnitude and completeness than expected—"exceeding my wildest dreams," as one expressed it—and the property as a whole very desirable for naval purposes.

Thanks to completeness for its war activity, Squantum's further naval usefulness does not lie only in the distant future. Besides the building equipment, lying ready but idle, berthing and ship's force repair facilities are available for 13 to 20 destroyers and submarines.

On Tuesday, July 27, 1920, arrived the U. S. S. *Meredith*, Lieutenant F. K. O'Brien, U. S. N., commanding, the first destroyer at Squantum since it became a naval base. Next day came the *Kimberly* and after three weeks the *Maddox*. All were awaiting their turn for repairs at Boston; meantime their coming to Squantum not only relieved the water front congestion at Boston but gave the destroyers the space and freedom from interruption desired. They were not long in making themselves at home, getting their chains, floor plates, and other gear out on the dock for cleaning and airing, and arranging other ship's force work in company without fear of disturbance. Swimming and sailing were daily indulged in, the baseball field was soon in use, and although extra trolley cars were added to the schedule for the convenience of liberty men, home attractions at Squantum even at this stage proved stronger for many. From the first they liked it, thankful to be in a place where their needs had first consideration and hopeful of development of the base's possibilities—recalling that scene in Norfolk in 1907, already described, but with the important difference that the physical possibilities and the facilities already existing are here much greater.

This beginning, however welcome and timely, serves to show only more plainly that we should go on and grow. The unproductive but unavoidable expenditure for the upkeep of an almost idle plant worth \$13,000,000 would become, with the small increase incident to a considerable activity, wholly productive. There is here the possibility of an invaluable military asset, in peace and war, and in the era of retrenchment now upon the country, the navy ought to shine in developing this property economically, as well as technically, organically, and administratively.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

GOOD STEERING

By LIEUT. COMMANDER A. M. R. ALLEN, U. S. Navy

A type of apparatus for studying the work of the steersman is described in the August number of the NAVAL INSTITUTE. This apparatus is very useful for experimental measurements, but is hardly applicable to the ordinary ship for everyday use. A simple method for obtaining the same result on board any of our modern battleships has often been used by the writer with excellent results.

Practically all the chart houses on the above mentioned class of ships are equipped with the Forbe's log and a gyro repeater. The log ticks at the rate of 100 per knot so that, from the speed of the ship, or the table of time intervals for different speeds furnished with the log, the time interval can be readily obtained. Use the ordinary plotting or ten square section sheets. Select one vertical line as the zero or course line. Have the assistant navigator read carefully, to the nearest one-half of a degree, the ship's head, to the right or the left of the course, each time the log ticks for a period of several minutes. Use one interval down for each tick, and one interval to the right or left for each one-half degree. Draw a smooth curve through the points so obtained, and the result will show you just how good the steersman is. From the number of sine curves per minute or longer you can get a still further comparison of the relative value of two apparently equally good steersmen, but under usual conditions, you will see at once which man is the better as the poor man's curves will not only be very irregular, but will generally show him steadying a degree or two off the course.

If you mark each sheet with the name of the man and the time, and post the sheets, you will soon get an interest aroused in this very important factor of ship control, and the resulting competition will more than pay you for your trouble.

It is essential of course that the work be done in the chart-house or central station, where the steersman does not know what is going on, and by selecting different times for your observations, he will always be on the lookout not to be caught doing poor work.

The conditions arising in fleet formation for this work are not as satisfactory as when steaming singly or in the lead, but fair results can be obtained if proper times are selected on long steady courses with a smooth sea.

A good course means such a saving in horsepower, that men should be trained for this work in small vessels, and only trained men used for this work on board battleships. The helmsman detail should be permanent and no changes made without permission from the navigator, so as to give this officer an opportunity to gradually weed out the men who in many cases never can be taught to steer properly.

The introduction of the gyro-compass has brought out many other interesting points in ship control bearing on the shaping of a good course, one of the most important being the frequent comparison of the master, repeater and magnetic compasses. The regulations now require the navigator to make these comparisons frequently, and this can best be done by having a comparison book kept on the bridge in which half hourly entries are made. Such a book is useful in many ways. First it ensures a careful attention to the comparative courses by the officer-of-the-deck, and the quartermaster; then it makes a permanent record that the above mentioned officer can refer to in case the gyro fails, enabling him to select the best course to steer until the navigator can be called or the gyro repaired, and finally it enables the navigator to check over not only the constant operation of his compasses, but to study the deviations of the magnetic compass under actual operating conditions.

Many officers and men still believe that the vibrating steering repeater is necessary and that it is impractical to use the relay for the navigational repeaters, but experience proves the contrary, and better courses can be steered and better bearings taken when the repeaters are operated through a properly adjusted relay, which entirely removes the hunt. Anyone who has watched the hunting repeater for a full two hour watch knows that it is a very severe eye strain, which is entirely eliminated when the relay is used. It will sometimes require personal demonstration that just as good

steering can be done with the relay, as with the vibrating compass, but once the steersman has become accustomed to the steady moving compass he will never want to use the other.

The application of the integrating center dial of the "Anschutz" compass to our steering repeaters will greatly improve the steering, as it will enable the steersman to see quicker which way the ship is going to swing, which is especially necessary with the long "firing interval" of the electric steering gear.

Good steering is so very important for the navigator, particularly in coasting, that if this part of his ship control organization is properly trained, and this otherwise routine work made interesting and competitive, by some such methods as those mentioned above, it will greatly assist him in this very important duty.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE FATE OF THE DREADNOUGHT

By LIEUT. COMMANDER GUYSBERT B. VROOM, U. S. Navy, and
WILLIAM OLIVER STEVENS

The war that has shaken so many things loose and toppled down so many venerable standards has now jolted the very foundations of our naval beliefs. On account of the naval history of that war there come now on all sides attacks on what has been since naval history began, the backbone of sea-power, the line of battleship; and these attacks are launched by men whose names carry great weight. Only recently Admiral Daveluy of the French service announced that the dreadnought "has lived." At the same time Admiral Beatty was reported to have said that "the ship of the future is the submersible battle cruiser," and that while battleships will not be superseded they "will be relegated to second place." As coming from the new First Sea Lord, the announcement suggests a revolutionary change of policy in the British Navy. A similar opinion is reflected in the "Memories" of Admiral Fisher. While he chuckles over the success of the dreadnought (which he invented) as an instrument for putting von Tirpitz's nose out of joint, he asserts that the heavily armored battleship, as designed to-day, "will be obsolete in five years." "Speed," he declares, "is the equivalent of armor." From our own navy came a newspaper article by a rear admiral, arguing that the dreadnought was doomed because of its inadequate protection, above against the plunging fire of long range guns and aircraft bombs, and below against mines and torpedoes. Finally, Sir Percy Scott has recently published his opinion in favor of building small craft instead of battleships.

It was not long ago that the *California* was launched at the Mare Island Yard, and on the same day the keel of the *Montana* was laid. Our building program calls for more dreadnoughts

whose plans have not even been drawn. But if the opinion of these authorities is to be accepted it is high time that we stopped spending from 20 to 30 millions for each one of these useless machines and devoted the money to better purpose. Can it be true that our navy is lagging behind the times in an hour of momentous change?

It is indeed true that there has been in our service, as in every other, much hard-shelled conservatism. In the early days generations of officers came and went without witnessing one significant change. Nelson's flagship, the *Victory*, which was launched in 1765, was the pride of the fleet at Trafalgar in 1805 and would have been just as serviceable if Trafalgar had been fought in 1835. It was naturally difficult for the officers of the old school to accept steam, rifled guns, torpedoes and armor, and they did so only with the greatest reluctance. But in this day one expects a ship to drop somewhat behind the times between blueprint and launching. Sensitiveness to the last word in naval development, therefore, is, as it should be, the very breath of the modern officer's nostrils. It is a curious fact that to-day these older officers, whom one would naturally expect to be conservative, are the ones who are calling for the revolution, while the majority of the younger officers at least are inclined to doubt. It is not conservatism that holds back these men who are fresh from chasing U-boats around the coasts of Ireland, but a desire to be "shown." They listen with respect to the opinion of these elders but they recognize no authority but facts.

Drawing "lessons from the war" is a game in which even the experts may go wrong. After the Civil War, for example, experts drew their lessons the world over and navies went through a period of building rams and monitors even though during the Civil War the monitor showed herself slow and unseaworthy and the rifled gun made ramming tactics exceedingly dangerous to the ship that tried them. Again, after the battle of the Yalu the success of the Japanese armored cruisers led the experts to boom this type now obsolete, although the real lesson was the ability of the Chinese battleships to stand terrible pounding and stay afloat. At this time drawing the right naval conclusions is imperative because it involves our national first line of defense. The American Navy is perfectly willing to paste the address of the junk man on every one of its battleships, if necessary, but it inclines to look sharply before it makes any extensive leap.

Let us consider first the new type suggested by the British, the "submersible battle cruiser." At the outset it is important to make a distinction between the pure submarine and the submersible. Everyone knows what a submarine is, but it is worth noting that it has a low speed and must depend on stealth to reach its position. The submersible is a vessel designed to operate on the surface at a relatively high speed and to submerge only when it has reached a favorable position for torpedo attack. Certain types of submersibles were produced during the war. For instance, the British developed behind a thick veil of secrecy, submersible monitors mounting 12-inch guns, the details of which are still hazy to the outsider. Now a submersible battle cruiser would have to be a ship mounting heavy guns, well furnished with torpedo tubes and encumbered with little or no armor because while on the surface she would lie awash, or nearly so, and would not need it. Further, the absence of armor would be an important consideration in the attainment of speed and wide cruising radius. Undoubtedly such a vessel would have important advantages. While on the surface, it would present a poor target to the enemy, it would theoretically, have a respectable surface speed and ability to keep the sea, and it could be able to deliver heavy blows with its great guns. It could also disappear beneath the sea and attack surface ships with the weapon and the tactics of the submarine. In co-operation with a surface fleet, it is easy to imagine such a vessel acting as a destroyer, making and repelling torpedo attacks and carrying out screening operations. It would be better than the destroyer in its vastly superior armament and in its power to submerge. In short such a type, if successfully developed, would combine the hard hitting power and the cruising radius of the battleship, united with the small exposure and submerging power of the submarine. Apparently this is what the British admirals have in mind, and if it can be made practicable it may indeed be the ship of the future.

At present, however, this type must overcome formidable obstacles before it can be called practicable. In the first place the anti-submarine devices that proved fatal to the U-boat in the last war would be even more fatal to a submersible battle cruiser. Granting that it took a large force of destroyers and aircraft to defeat a comparatively small number of submarines, the fact remains, nevertheless, that a large equipment of anti-submarine devices were developed late in the war which go far to curtail sub-

marine activity in the future. All these would be effective against the submersible. If operating by day, seeking to deliver a torpedo attack under water, it would have small chance of escaping detection by aircraft, destroyers and listening devices. It is easy to imagine such a vessel hounded to the death, from the moment it left the shelter of its own fleet, by a swarm of destroyers, "blimps" and planes. Escape for a huge submersible by diving would be impossible because on account of the difficulties of hull construction, which would involve much technical discussion to go into, it could not make way at a great depth as a submarine can, and it could only hope to lie on the bottom in comparatively shallow water until pursuit slackened. In that case, betrayed by escaping bubbles or oil, it would have to reckon with the depth bomb and explosive drag, with small chance of escape. Further, the development of listening gear has attained such a point that the big submersible could be heard and located accurately long before it could strike. To succeed then, this submersible must find means of defence against devices which proved fatal to the submarine and to which it would be even more sensitive than the submarine.

Another great difficulty, a mechanical one, has to do with propulsion. This has been one of the greatest handicaps in the progress of the submarine. The earlier types depended on gasoline engines and storage batteries, the former for surface and the latter for underwater propulsion. While the submarine was on the surface the gasoline engine served to charge the battery as well as to drive the screws. Both sources of power were very unsatisfactory because of the fumes from the gasoline engine and the hydrogen or chlorine gases from the batteries. In recent years the acid battery has been displaced by the alkaline type and the gasoline engine by the heavy oil. These lessened the dangers to the crew, but they effected no material mechanical improvement. There still remain the excessive weight and general unreliability that accompany all internal combustion engines.

Now a "battle cruiser" to-day—the *Renown*, for instance—means a ship of some 30,000 tons displacement, requiring about 100,000 horsepower to drive it at 30 knots. Suppose for the moment all the enormous difficulties of hull construction for a submersible of this size were overcome, the dead weight of internal combustion engines required to deliver anything approaching this power would be absolutely prohibitive. Even then, of course, the

submersible could not make a rate of speed comparable with that of the surface cruiser with the same engine power because the greater part of its hull would be under water. Whatever improvements may develop in driving power would always keep the surface craft much faster than the submersible, and speed in naval tactics is a factor that is paramount. Indeed, it was the low speed of the submarine in the last war that made it helpless to attack swift moving surface ships and rendered it a prey to the destroyer.

Experiments have been made to utilize steam for submersibles on the surface. The French Navy used it for their submarines without success for they found that it delayed their submerging. The English, however, have continued the experiment by building a submarine propelled by steam on the surface which can make a surface speed of 24 knots. But this boat is of limited cruising radius, and cannot stay submerged long because of the need of coming up to recharge batteries. If the submersible was steam-driven on the surface, that would have to be its sole motive power, because a ship of that size could have only one set of engines; what is most needed is an invention that will adapt steam to underwater propulsion, where any submersible type is still hopelessly slow. In brief, compared with surface ships the submersible is still at a heavy disadvantage in relation to speed and always will be so as long as water is harder to push out of the way than air. And compared with the pure submarine, the submersible would be much slower under water because of its top hamper and heavy guns and gun mountings.

Let us suppose that the submersible battle cruiser had managed to apply steam to underwater travel. What of its hitting power? Would it depend chiefly on its big guns or its torpedoes and how would it compare with a surface ship of equal armament? If it depends mainly on its guns it would labor under a serious handicap compared with the surface ship. In these days gunnery is almost an exact science and the target is found as the resultant of mathematical data. The surface ship with its high range-finding platforms and tops would be able to fire a ranging salvo and its spotters would be "on" before the submersible could get its guns into action at all. Under present day conditions, at least, all the advantages in controlling and co-ordinating big gun fire—the very essence of

surface fighting—lie overwhelmingly with the surface type. As for the underwater weapon, the torpedo, it has unquestionably developed greatly in the last decade. Under specially favorable circumstances (as in the twilight and mist of the battle of Jutland) it may have a highly important effect on the outcome of a fleet action. But the torpedo is not yet an instrument of precision. It is still only a secondary weapon because it requires that the firing vessel shall be able to maneuver into a favorable position and obtain precise mathematical data by observation. The uncertainty of any one of many essential factors makes the shot a hit or miss affair. If the submersible tried to reach its position for attack under water it would have to trust entirely to luck to get a hit, because it would be so slow in comparison with surface ships. Submarines were never able to hit the swift-moving vessels in any naval action in the North Sea. If it tried to operate on the surface as a destroyer, it would lack the destroyer's speed and flexibility.

So far, we have considered only the problem of a submersible battle cruiser in conflict with surface types. Of course a fight under water between two submersibles is exactly like a fight between two men in a dark room. A conflict under water that was not mere blind man's buff would depend on submarine radio direction finders, possibly assisted by aircraft. But these agencies are not yet developed to any such degree that they can be depended on for much practical value. Air craft, especially, depend on bases and cannot be expected to operate far from land or from a "mother" ship.

In sum, this submersible battle cruiser of the future must combine all the virtues of the dreadnought and the pure submarine without assuming faults that outweigh them. At present the handicaps of the proposed type seem to preponderate heavily. The fact is that this is a hybrid, a compromise type, trying to be both surface ship and submarine. In naval history, compromise types have never proved successful, and this promises to be far less so. Even Lord Fisher, who regards the dreadnought as "obsolete in five years," pins no great faith on an underwater type to take its place. "Wireless," he says, "is the weapon of the strong. So is the submarine—that is, *if they are sufficiently developed and diversified and properly applied*, but you must have multiplicity of species."

In other words, he regards the submersible types as only auxiliary to the command of the sea.¹

So much for the "ship of the future." Not all the authorities quoted at the opening of this article are in favor of the "submersible battle cruiser," but all are agreed on the decline and fall of the dreadnought. The line of battleship, which in one form or another has been the naval unit since the days of the Minoan kings, is pronounced dead, and apparently in the British Navy arrangements are being made for the funeral. But perhaps it is yet possible to maintain of the passing of the dreadnought, as Mark Twain did about the report of his own death, that it is "greatly exaggerated."

What is the matter with the battleship? Rear Admiral Daveluy writes that "she has lived," because of these conditions in the war: she was forced by the submarine to keep mainly within defended harbors, and to take the sea with circumspection, guarded by destroyers and other light craft; she was unable to give safe conduct to merchantmen; and, finally, she was vulnerable to mine and torpedo. To these objections the American admiral adds the arguments, already noted, concerning her vulnerability to mine and torpedo underneath the surface, and to aerial attack and plunging fire above.

On the other hand, the evidence of the war seems to prove overwhelmingly that the ship of the line has remained mistress of the sea. Several, it is true, were lost by mines, and a very few by submarines, but the vast majority of the ships kept afloat and thereby held the control of the sea for the Allies. It was the difference in strength between the battleship force of Great Britain and Germany—a difference that neither mine nor torpedo was able to affect—which gave the highway of the sea to the Allied

¹ Since this article, was written, the following opinion has been published in Brassey's *Naval and Shipping Annual* by Sir George Thurston, an eminent naval architect and chief constructor for Vickers. As to the possibilities of a large submersible battleship, Sir George holds that "it is practically certain that, apart from its questionable value as an efficient fighting unit, the dimensions of an unarmored submersible with armament and speed equal to that of the modern capital ship would be such that even the most advanced naval expert would hesitate to accept the responsibility for its recommendation."—Quoted in *N. Y. Times*, Jan. 6, 1921.

cause and closed it to the German. Although the dreadnought herself was not adapted to combat the new peril of the submarine, it was the supporting power behind the destroyers that did combat it. These smaller, unprotected vessels were enabled to range the sea in pursuit of their quarry because of the protection of the Grand Fleet. The fact that this fleet spent most of its time at Scapa Flow does not mean that it was impotent. Even if there had been no submarine menace these dreadnoughts would have remained at their base most of the time watching an enemy that had to choose between inaction and accepting battle under unfavorable conditions.

It must be remembered that the war was fought under peculiar circumstances. The maritime theatre of action was largely restricted to the North Sea, a body of water small in area and shallow in depth. The fleet that commanded the sea would naturally remain most of the time in the security of its base. Submarines were unable to prevent that fleet from taking the sea for its periodical sweeps and for target practice at will. As for mines, it must be remembered that the open ocean is not susceptible of being mined as was the North Sea. In the case of adversaries separated by a whole ocean, who shall say that the battleship would be antiquated and useless? The Germans bent every energy to the task of intercepting troop convoys from this country, but all their mines and submarines availed nothing. If this was true of large groups of ships gathered haphazard and manned often by inexperienced officers, the protection of a battleship force from the submarine menace by its own screening flotillas need hardly be regarded as beyond hope!

It is worth remembering that in the Battle of Jutland not one dreadnought on either side was sunk. And after the battle of Dogger Bank it was possible to tow the disabled battle cruiser *Lion* back to port, in the face of enemy submarines, because of the effectiveness of the destroyer screen.

The argument about bombs and plunging fire depends upon the assumption that it is not feasible to protect the battleship in that quarter as well as against direct fire. Moreover the "danger area" at the long ranges involving plunging fire is extremely small; the fleet that does the best shooting and has the most powerful guns will have that advantage, as it would have in

any case. Under water, it is true, the battleship is unprotected, but as in the case of deck protection, the solution would seem to be not the discarding of the type, but the adaption of construction to cover that weakness. This has always been the story of the battleship from time immemorial; new conditions have made alterations, but the battleship has remained. Certainly the protection of the dreadnought offers no such mechanical and engineering difficulties as are confronted in the proposed "submersible battle cruiser." For instance, the "blisters" on the hulls of certain British ships, notably their monitors, proved a defence against torpedoes during the war; and the "cellular" construction of the hull of a battleship like the *Maryland* should localize the effect of any underwater explosion.

Some of the recent discussion on this subject has centered on the possibility of attacks on battleships by air craft controlling torpedoes by radio. But at present the stage reached in this form of tactics seems hardly far enough advanced to justify scraping the battleship. The dependence of air craft on shore or on mother ships, the accuracy of control required for the success of such attacks from a safe height, and other elements in the problem, leave this form of tactics still in the experimental stage.

What, after all, does the dreadnought stand for? It is a combination of the great essentials of a naval unit—speed, protection, ability to keep the sea, and a maximum of hitting power. Nothing that the war developed has upset any of these prime factors; nothing that has been suggested to take its place offers any equivalent for this combination. Of course the phrase "ship of the future" may mean anything. The discussion here has centered on the immediate future—say the next five years at least. At any time an invention may come along that will upset all previous calculations, and he would be rash indeed who would venture to predict anything definite without great circumspection. Of the distant future it seems likely that the navy may leave the seas for the oceans of the air. Already the air has become an invaluable extension of the sea. But that day is likely to be beyond the vision of this generation. As long, however, as ships sail the surface of the waters, so long will the unchanging elements stand. Cruising radius, the ability to stand punishment, accuracy and weight of gun fire, the concentration of great offensive power on

one keel—all these things count now as they always have counted, as the things to be desired of the units of the fleet. Under changing forms and in changing proportion these things in the past have been represented by the ship of the line, or as we call it to-day, the dreadnought. The burden of proof therefore rests heavily on those who would say that this type "has lived."

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POSITION PLOTTING BY RADIO BEARINGS

By ELMER B. COLLINS, Nautical Expert

The navigator approaching the coast after a stormy passage with unfavorable weather conditions that preclude the employment of observations of the celestial bodies, or the determination of a reliable fix by other known navigational methods, naturally experiences a gratified feeling of confidence and a minimum degree of anxiety over his responsibilities if perchance he has other auxiliary means whereby he may check on the unreliable and uncertain dead reckoning position of his vessel. The radio bearing has supplied this need to a certain extent and is the latest modern aid to the mariner in position finding, therefore, during the experimental stage in determining what reliance may be placed on it, as a helping factor, it behooves every progressive navigator to note with care and check closely his position as determined by radio bearings.

Fixing position by radio is very much similar to the well-known methods of a fix by cross bearing on near visible objects, differing mainly in the fact that the radio towers are widely separated in distance and the vessel generally much farther off shore, hence it becomes necessary when these bearings are plotted on the much distorted Mercator Chart to take into account and determine the proper correction for the curvature of the earth.

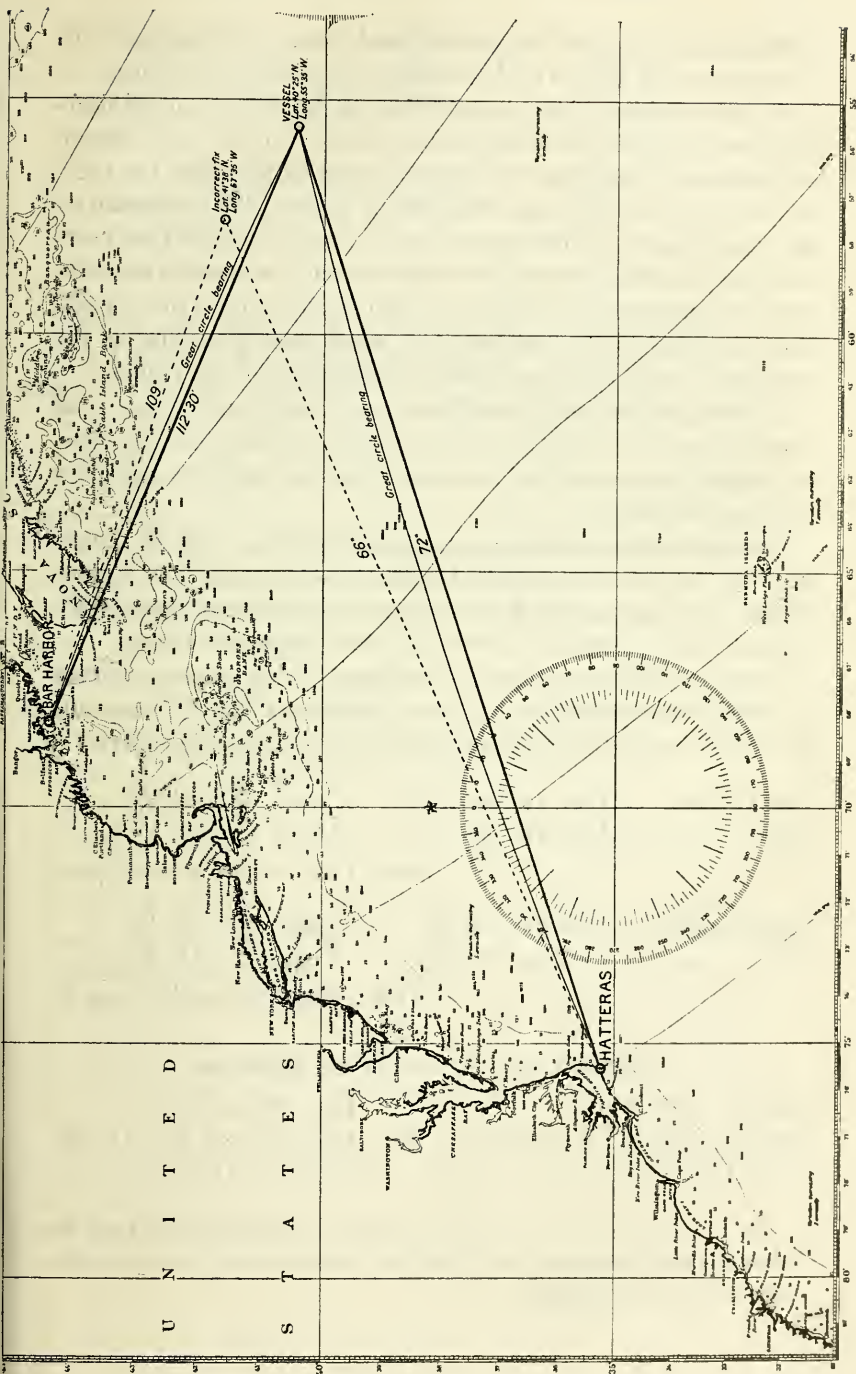
An accurate fix by radio cross bearings depends upon the degree of precision with which the direction of radio waves can be determined, and experience has already demonstrated that skillful operators with instruments in excellent working condition and good adjustment are capable of sending from their stations to any vessel at sea during daylight true bearings with a maximum error of not over two degrees. The error of waves sent at night is believed to exceed this amount although there has not been suffi-

cient available data supplied up to the present time to verify this questionable condition of affairs. The radio bearing being a great circle is laid down on the navigator's Mercator Chart as a curve concave towards the equator but curving most when bearing east or west and straightening out as the bearing changes to the north or south, so that when bearing due north or south it becomes the straight meridian line of the chart.

The meridians of the earth converging as they do at the poles and being a series of non-parallel lines cause all great circles intersecting them to cut every meridian at a different angle. On the Mercator Chart these meridians are shown as true parallel lines, therefore it follows that the air line bearing, being the angle contained by a great circle passing through the vessel, the radio station and its respective meridian cannot be shown on this particular kind of a chart by a straight line, consequently a radio bearing plotted as a Mercator bearing will cause the position or fix by cross bearings to be in many cases in error by a hundred miles or so, hence absolutely worthless to any navigator in checking the position.

A simple method is therefore proposed here that will aid and assist the navigator in using these radio bearings on a chart of this projection, placing him in the closest approximation to the vessel's true position and giving him confidence in the bearings received. Bearings may be utilized up to distances of about 1000 nautical miles off shore. In plotting these radio bearings it is suggested that the largest scale charts on board that include the radio stations and the vessel's dead reckoning position be selected and it is essential that the bearings be laid down with extreme care where the distance off shore is a large number of nautical miles.

A vessel upon receiving radio bearings from two radio stations first plots the Mercator fix as in ordinary cross bearings, paying no attention to distortion and curvature; proceed then to take off the latitude and longitude of this incorrect fix. In nine cases out of ten this plotted fix will differ from the true position. Assume that the fix is the true one and then proceed to find the true bearing of this fix from each of the two stations. Enter the azimuth tables (or Weirs diagram) with the latitude of one station as the latitude; the latitude of the plotted fix as the declination and the difference in longitude between the fix and the station converted into hours and minutes as the hour angle and take out the azimuth or true bearing of the fix. The difference between the bearing sent by



radio and this bearing from the azimuth tables, or diagram, is the correction to be applied to the radio bearing for the curvature.

In north latitude if the vessel is east of the station and all bearings are sent from the radio stations from 0° to 360° , then should the bearings taken from the azimuth tables be less than the radio bearing the position of the Mercator fix plots to the northward of the true position. If the vessel is west of the station and the bearings from the table exceeds the radio bearing the true fix is southward of the plotted fix. The correction is to be applied to the radio bearing either to the northward or southward according as the trial fix is found to be northward or southward of the true fix.

In the southern hemisphere the reverse conditions are true. All great circles in the locality of the equator are shown on the chart as straight lines, therefore no corrections are required in practice for these bearings.

Example.—A vessel in dead reckoning latitude $40^{\circ} 15' N.$; longitude $55^{\circ} 30' W.$ receives radio bearing of vessel from Bar Harbor Station 109° , and a radio bearing from Cape Hatteras Station 66° . Find the true position of the vessel on the Mercator Chart.

Proceed first to plot the radio bearings as cross bearings and the position of the fix is found to be in latitude $41^{\circ} 38' N.$, longitude $57^{\circ} 35' W.$ (it will be noted that this fix is over 100 miles in error).

Bar Harbor	Lat. $44^{\circ} 19' N.$	Long. $68^{\circ} 11' W.$	
Fix	Lat. $41 \quad 38 \quad N.$	Long. $57 \quad 35 \quad W.$	
		Diff. Long. = $10^{\circ} 36' = 0^h 42.4^m$	
Cape Hatteras . .	Lat. $35^{\circ} 14' N.$	Long. $75^{\circ} 32' W.$	
Fix	Lat. $41 \quad 38 \quad N.$	Long. $57 \quad 35 \quad W.$	
		Diff. Long. = $17^{\circ} 57' = 1^h 11.8^m$	

AZIMUTH TABLES OR WEIR'S DIAGRAM

Lat. $44^{\circ} 19' N.$	} Azimuth $105^{\circ} 38'$	Lat. $35^{\circ} 14' N.$	} Az. 60°
Dec. $41 \quad 38 \quad N.$		Dec. $41 \quad 38 \quad N.$	
H. A. $0^h 42.4^m$		H. A. $1^h 11.8^m$	

The vessel is east of the station and the bearing of the trial fix is less than the received radio bearing showing the fix to be northward of the true position.

Bar Harbor	$109^{\circ} - 105^{\circ} 38' = 3^{\circ} 22'$
Cape Hatteras	$66^{\circ} - 60^{\circ} = 6^{\circ} 00'$
Bar Harbor radio bearing.....	$109^{\circ} 00'$
Correction	$+3 \quad 22$
Corrected bearing	$112^{\circ} 22'$
Cape Hatteras radio bearing.....	66°
Correction	$+6$
Corrected bearing	72°

With the Mercator bearing $112\frac{1}{2}^{\circ}$ from Bar Harbor and 72° from Cape Hatteras laid down as cross-bearings will give the true position of the vessel in latitude $40^{\circ} 25' N.$, longitude $55^{\circ} 35' W.$

When vessels are fitted with radio compasses or direction finders by which they obtain the bearing of radio towers whose positions are determined the same procedure for laying off the trial fix by Mercator bearings can be adopted. Proceed then to find from the azimuth tables or Weir's diagram in a similar manner the true bearings of the radio station from the plotted fix and then apply the correction in the converse way in both hemispheres to that given in the above case.

Radio bearings may be combined with position lines obtained from astronomical observations or at short distances as position lines similar to the well-known Sumner line when avoiding dangerous shoals or reefs or when making the coast.

In conclusion it can be said that in order to get an accurate practical fix without the annoyance of making corrections to the radio bearings, a chart on the Gnomonic projection (somewhat different from the Great Circle Charts, in that it has an especially arranged compass to facilitate the plottings of the true bearings), is needed by the navigator for these long distance bearings, when it remembered that the Mercator Chart is not without its distortion and imperfections. It must also be noted that in a distance of only 60 miles an error in the bearing of but one degree causes an error of one mile which may cause a greater error in a carelessly plotted fix, or should the angle between the cross-bearings be 20 degrees or less, then greater errors may result in determining the true position if the azimuth is only approximately and not accurately interpolated.

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UNDER-WATER TRAJECTORIES¹

By ALAN S. HAWKESWORTH, F. R. S. A., Mathematician,
Bureau of Ordnance

As a concrete case, were a 6-inch shell—weight 105 pounds, coefficient of form .61, muzzle velocity 3000 ft./sec.—fired horizontally into a water tank 6 feet above its floor, how far will this shell travel under water before it strikes the floor of the tank? What will be the elapsed time in seconds? And what will be the residual or striking velocity? And the striking angle or angle of fall?

The volume of the shell is 471.098 cubic inches, and it thus displaces 17.012 pounds of water, weighing 62.4 pounds per cubic foot, or .036111 pounds per cubic inch. So that the reduced weight of the shell under water will be 87.988 pounds.

Next, air weighs .08071 pounds per cubic foot to water's 62.4. So that water is 773.06 times denser than air; with a correspondingly magnified resistance. Hence our modified ballistic co-

efficient for our under-water trajectory must be $C_1 = \frac{W_1}{(773.06)jd^2}$.

Wherein W_1 is our modified under-water weight of our shell; j is

¹ Comment by the Bureau of Ordnance: Hawkesworth's article has been checked over by the Bureau and is correct so far as the validity of the assumptions and evaluations are concerned. In some cases the calculations are based upon the approximations of the ballistic functions, which seems a justifiable procedure.

The conditions chosen are such as to make the conclusions of interest mainly from a theoretical point of view, since the shell is assumed to be fired horizontally into the water, and the effect of entry into the water at the varying angles of impact found in practice is not considered. The latter condition complicates the problem of the trajectory considerably, especially at the usual angles of fall, that is, below the neighborhood of 22½ degrees.

our coefficient of form; and d^2 is the square of the shell's diameter. While 773.06 is our enlarged resistance factor.

$$\begin{array}{rcl}
 62.4 = 1.795185 & j = .61 = & \overline{1.785330} \\
 .08071 = \overline{2.906972} & d^2 = 36 = & \overline{1.556303} \\
 773.06 & \overline{2.888213} & \overline{2.888213} \quad W_1 = 87.988 = \overline{1.944423} \\
 & & \overline{4.229848} \quad \overline{4.229846} \\
 & & C_1 = .00518295 = \overline{3.714577}
 \end{array}$$

Thus our amended ballistic coefficient is $C_1 = .00518295$.

Thirdly, to determine the amended gravity coefficient g_1 for under water. Now force, in this case the shell's weight, is ever the product of mass (a fixed thing) by acceleration; which here is g_1 . So that $M = \frac{W}{g} = \frac{w_1}{g_1}$ or $g_1 = \frac{w_1}{W} g$, wherein W is the absolute weight of the shell *in vacuo*; that is, its weight in air, plus the weight of the volume of air displaced by it; w_1 is its diminished weight under water; g is the gravity coefficient *in vacuo*; and g_1 is the desired new gravity coefficient for under water, which plainly must vary as the specific gravity of the sinking object, in this instance being 26.949 ft./sec.².

$$\begin{array}{rcl}
 w_1 = 87.988 = & \overline{1.944413} & \\
 g = 32.16 = & \overline{1.507316} & \\
 & \overline{3.451729} & \\
 W = 105 = & \overline{2.021189} & \\
 g_1 = 26.949 \text{ ft./sec.}^2 = & \overline{1.430540} &
 \end{array}$$

And similarly for any medium. Thus the gravity coefficient g_1 for any given object in air will be equal to the absolute coefficient g for vacuum, multiplied by the proper fraction $\frac{w_1}{W}$, whose numerator w_1 is the known weight of the given object in air, and whose denominator W is the absolute weight of said object; that is, its weight in air, plus the weight of the volume of air displaced by it.

Now time $= t = \sqrt{\frac{2S}{g}}$, wherein S is the space fallen through in feet, in this case 6 feet, so that $t = \sqrt{\frac{12}{26.949}} = .6673$ seconds.

Next, evaluating Mayevski's and Siacci's functions, for a velocity of 3000 ft./sec. the functions $S_v = 1715.7$; $T_v = .522$; $A_v = 62.10$; $I_v = .04163$.

Then for the calculated time .6673 seconds = $C_1 \sec a T_2 - C_1 \sec a T_v$.

$$\therefore \frac{.6673 + C_1 \sec a T_v}{C_1 \sec a} = T_z = \frac{.6673}{C_1} + T_v; \text{ when } \sec a \text{ is unity.}$$

$$.6673 = \overline{1.8243205}$$

$$C_1 = \overline{3.7145770}$$

$$128.749 = \overline{2.1097435}$$

$$T_v = \overline{.522}$$

$$T_z = \overline{129.271}$$

The velocity determined by this value for T_z is given by the equation

$$T_z = 129.271 = \frac{[4.3301086]}{V} - 15.4595.$$

$$\therefore 129.271 + 15.4595 = \frac{[4.3301086]}{V}.$$

So that

$$\log 144.7405 = 2.1665605 = 4.3301086 - \log V;$$

or

$$\log V = 4.3301086 - 2.1665605 = 2.1635481 = 147.7757 \text{ ft./sec.}$$

Wherefore this must be the velocity at the end of the .6673 seconds. The space travelled under water in the same time must be

$$\text{Space} = C_1 \{ 158436.8 - \text{antilog}$$

$$(4.6923245 + \log \log 147.7757) \} - C_1 S_v.$$

$$\log \log 147.7757 = \log 2.1695481 = 0.33636962$$

$$158436.8$$

$$106830.3$$

$$S_2 = 51606.5 = 4.7127045$$

$$S_v = 1715.7 = 3.234441$$

$$C_1 = \overline{3.714577}$$

$$\overline{0.949018} \quad 8.8924$$

$$4.69232450$$

$$106830.3 = \overline{5.02869412}$$

$$S_2 = 51606.5 = 4.7127045$$

$$C_1 = \overline{3.7145770}$$

$$267.474 = \overline{2.4272815}$$

$$8.8924$$

$$\text{Space} = \overline{258.5815} \text{ feet.}$$

So that the space travelled under water in the specified .6673 seconds will be 258.5816 feet, with a residual velocity there of 147.7757 ft./sec.

By Lieutenant Schuyler's empirical formula, deduced from an experiment at the Indian Head Naval Proving Ground, the under-water travel should be 254.723 feet; his corrected and condensed formula, after allowing for an error in a coefficient K , and also for the greater density of sea water (1.026), for the distance travelled during the reduction of the initial velocity of $V_1=3000$ ft./sec to the residual velocity of $V=147.7757$ ft./sec.; while $W=105$ pounds, the weight of the shell in air, will be

$$\text{Space} = \text{antilog} \left\{ \frac{1}{3} \log W + 1.615872 + \log (\log V_1 - \log v) \right\}$$

$$W = 105 = 2.021189$$

$\begin{array}{r} 3) 0.6737297 \\ 1.6158720 \\ 0.1164660 \\ \hline 2.4060677 = 254.723 \text{ feet.} \end{array}$	$\begin{array}{r} \log 3000 = 3.477121 \\ \log 147.7757 = 2.1695481 \\ 0.1164660 = \hline 1.3075729 \end{array}$
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The angle of fall ω of the shell at the said point, or range, of 258.5816 feet, is given us by $\tan \omega = \frac{C_1 \sec^2 \alpha}{2} \left[I_z - \frac{A_z - A_v}{S_z - S_v} \right]$.

First, then, to determine A_z by the formula

$$A_z = \text{antilog} \{ [9.8665032] - 2 \log V \} + \text{antilog} \{ \log \log V + 4.3151504 \} - 68192.39$$

$\begin{array}{r} \log V = 2.1695481 \\ \hline 2 \\ 4.3390962 \end{array}$	$\begin{array}{r} \log \log V = 0.33636962 \\ 4.31515040 \\ \hline 4.65152002 = 44825 \end{array}$	$\begin{array}{r} 9.8665032 \\ 4.3390962 \\ \hline 5.5274070 \\ 336827 \dots \dots \dots 5.5274070 \\ \hline 381652 \\ 68192.39 \\ \hline 313459.61 = A_z \text{ at } V = 147.7757 \text{ ft./sec.} \end{array}$
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Secondly, similarly determine I_z by the formula

$$I_z = \text{antilog} \{ 5.8374246 - 2 \log V \} - 0.419591.$$

$\begin{array}{r} 5.8374246 \\ 4.3390962 = 2 \log V \\ \hline 1.4983284 = 31.5013 \\ 0.419591 \\ \hline 31.081709 = I_z \text{ at } V = 147.7757 \text{ ft./sec.} \end{array}$	
--	--

Hence,

$$A_z - A_v = \Delta A = 313397.51; \quad S_z - S_v = \Delta S = 49890.8;$$

$$I_z - I_v = \Delta I = 31.040079.$$

So that ω the angle of fall can be derived from

$$\tan \omega = \frac{C_1 \sec^2 a}{2} \left[I_z - \frac{A_z - A_v}{S_z - S_v} \right].$$

$$\begin{aligned} A_z - A_v = \Delta A &= 313397.51 = 5.49609865 \\ S_z - S_v = \Delta S &= 49890.8 = 4.69802040 \\ \frac{0.79807825}{\Delta S} &= \frac{\Delta A}{\Delta S} = \frac{I_z = 31.081709}{6.281720} \\ &= \frac{24.799989}{1.394452} \\ C_1 &= \frac{3.714577}{1.109029} \\ &= 2 \quad 0.301030 \\ \tan 3^\circ 40' 38''.1 &= 2.807999 \end{aligned}$$

The shell, then, striking the bottom of the tank this glancing blow at $3^\circ 40' 38''$, will ricochet upwards, at the same or nearly the same angle; describe a low trajectory arc; again strike the bottom at a much increased angle and much diminished residual velocity; again ricochet and repeat the performance, until it comes to rest. And its residual velocity at the point of second ricochet will be given by the equation

$$\log V = \frac{1}{2} \{ 5.8374246 - \log (I + 0.419591) \}.$$

And the needed value here of I_z will be approximately given by

$$I_z = \frac{\sin 2a}{C_1} + I_v.$$

$$\begin{aligned} \sin 2a = \sin 7^\circ 21' 16'' &= 1.107237 \\ C_1 \quad 3.714577 & \\ \hline &= 24.69800 \\ I_v &= 31.081709 \\ &= 55.779709 \\ &= 0.419591 \quad 5.8374245 \\ \hline &= 56.199300 = 1.7497311 \\ &= 2) 4.0876934 \\ V = 110.6233 \text{ ft./sec.} &= 2.0438467 \end{aligned}$$

Evaluating the new corresponding function S_z ,

$$S_z = 158436.8 - \text{antilog}(4.6923243 + \log \log V).$$

$$\log \log V = \log 2.0438467 = 0.310448274$$

4.692324300	158426.8
5.002772574	100640.37
	$S_z = 57796.43.$

And since the space traversed equals $C_1(S_z - S_v)$,

$$S_z = 57796.43$$

$$S_v = 51606.5$$

$$\frac{6190.0}{3.791691}$$

$$C_1 = 3.714577$$

$$\frac{1.506268}{32.082 \text{ feet.}}$$

Yet this surely overlooks two considerations, one of which is very important. First, the glancing blow struck by the shell must certainly destroy some of its energy and velocity, and probably also lowers somewhat its angle of rebound or ricochet, both factors shortening the rebound and making it less than the calculated 32 feet.

Then, secondly and chiefly, the rotation of the shell to the right (as seen from its rear), the moment it touched and was reacted upon by the bottom of the tank, would throw it violently to the right, causing it to "corkscrew" erratically in that direction and smash into the right-hand wall of the tank perhaps 6 or 8 feet beyond the point where it scraped the tank's bottom.

To sum up, then, by simply employing the familiar formulas of Mayevski, Siacci, Ingals, and Alger, but using a modified ballistic coefficient C that is 773.06 times less than the ordinary coefficient for air, we will be easily able to calculate any under-water trajectory; while a similar correction will make available, for this purpose, the exterior ballistics methods of Moulton and of Garnier. So that, were one to draw the graphs of, say, the retardation or of the resistance, then the companion graphs in air and in water would be identical; save only that those in water would be "telescoped" down, with ordinates only $\frac{1}{725}$ times the size of those in air. Nor need we be concerned here about the breaks or "stop points" in Mayevski's functions, nor even consider the change of retardation at the critical point of the velocity of sound in the medium—

in this case in water—since the flattening of our graph is so excessive, being but $\frac{1}{9\frac{1}{2}5}$ of its previous air value, that any and all such influences are practically negligible.

The changes in resistance and thus in retardation, by changes in the temperature, and above all in the salinity of the water, can easily be allowed for by a corresponding change in the density divisor and diminished weight.

Or were we asked to determine the projectile's path upon entering the water, at the finish of a trajectory in air, then we but need to take the calculated residual velocity and angle of fall at the said point as our initial velocity and angle of departure for the required under-water trajectory.

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PERRY'S EXPEDITION TO JAPAN

By MARY H. KROUT

The maker of records can seldom forecast the future with much accuracy. He writes, in reality, for his own times, and cannot realize events that are destined to reshape that which he had witnessed. What is taking place in Japan to-day is proof of this statement. It is the sequel to the remarkable narrative of the young Virginian, J. W. Spalding, who accompanied Perry's expedition to Japan in 1852 and saw the first break in jealous seclusion in which that hermit nation had maintained itself. The book is still to be found in a few libraries. In his terse preface the author states that through the courtesy of Commander Sydney Smith Lee, he obtained a position as "chief clerk on his ship to accompany the expedition." This record is of value therefore, being largely that of an eye witness, without the technicalities of an official report.

Commander Matthew Calbraith Perry, son of the great naval hero, Oliver Hazard Perry, was given command of the expedition by President Millard Fillmore, with the steam frigate *Mississippi* as the flagship of the squadron, which had already made a brilliant record in saving the *Cumberland* driven on a reef in the Gulf of Mexico, taken a decisive part in the Battle of Vera Cruz, and in other exploits. As has happened before and since, she was poorly equipped for her long voyage. Designed to draw 18 feet of water and to carry the capacity of 600, her guards a little above the water, she put out to sea "her decks not yet cleared, and the stores hastily put on board." Madeira was the first land sighted, after which they ran into the northeast trades and experienced the difficulties of navigating a steam frigate in high wind and heavy seas. The coal supply now began to run low and by way of saving, the engines were stopped, fires extinguished, "a sufficient number

of the paddles removed from the wheels which were lashed, the large smoke stack lowered on the hurricane deck and the ship put under sail."

The most interesting event of the outward voyage was the call at St. Helena. Officers and men went ashore, and Spalding walked the nine miles—a steep and stony climb—to Napoleon's tomb and "Longwood."

Capetown was paid a brief visit—its clouds of red dust, the low straggling houses stretched along level, uninteresting streets under the shadow of Table Mountain affording few attractions aside from the fine gardens. The polyglot population, however, of English, Dutch, Bengales, Kaffirs, Malays and Chinese interested the Americans.

The squadron also called at Colombo, St. Galle, Singapore, which were briefly inspected and finally, in cloudy, boisterous weather, at the Ladrone Islands, the squadron entered Chinese waters. Hong Kong and Shanghai gave both officers and men a little much needed change and recreation.

The manner of their reception in Japanese waters was decidedly problematical. No western ship, except those of the Dutch at long intervals and under stipulated conditions, had ever penetrated its ports.

The doubtfulness of the situation, considering the enormous population of the crowded country and their war-like character emphasized the need of what to-day has become a familiar term, "preparedness."

During the long voyage much time had been given to drills "going to quarters morning and evening for inspection; the whole ship's company, once a week beat to general quarters; magazines opened; powder boys busy passing and repassing cartridge boxes; guns cast loose and worked by their crews; boarders called away and pikemen posted to repel boarders, with marines stationed near them. Orders were given for sail-trimmers to put stoppers on such portions of the rigging as an active imagination suggested must have been shot away; all the evolutions of an actual engagement gone through."

One arrangement made at Capetown which caused much discomfort during the latter part of the voyage was thus scathingly described. There "twelve of the large-horned Cape bullocks and a number of the Cape sheep with tails wide as a dinner plate were

put on board. The stalls of the larger cattle were on the fore-castle, and on the quarter deck, tied up to the halyard racks. When the ship rolled heavily the noise of these poor animals endeavoring to conform to the ship's movement, or disturbed by the men getting at the ropes which their large horns covered, and their continued tramping over the heads of those below deck was, of course, increasing the comfort of the shipboard hugely.

"Then during a rough night some steer would tumble down and dislocate his thigh, requiring the butcher's axe to dispatch him the next morning. On the port side of the quarter deck," he ruefully continues, "the bleating of the sheep from the fold made by lashing oars from the breach of one gun to another, was quite melliferous. In the necessity, had one arisen, of fighting ships," he concludes, "overboard would have to go the beef-cattle; if the ship had been required to salute a superior command met at sea orders would have been given, perhaps as follows:

" 'Starboard (look out for the bull) fire. Port (you'll get kicked) fire. Starboard (don't hurt those sheep) fire.' " The Riu Kiu, or as Spalding wrote it, the Loo Choo, islands were chosen as the base of operations "on the principle of reaching the old hen by going after the chickens first. There," he said, "getting our anchorage we felt as if we had arrived at the outer door of the hermetic empire we had come so far to deal with, we then being only eight or nine days from the Bay of Yedo."

Previous to arrival a general order had been issued requiring lookouts to be kept in port, as at sea, all movements of vessels or collection of boats to be reported to the officer of the deck and by him to his superiors; sentinels armed with loaded muskets and six rounds of ball cartridge; general and decision exercises of great guns and small arms, with artillery and infantry drills, were to be prosecuted with increased diligence, while in navigating those seas still more attention was to be given to secure safety, than to accomplish quick passages.

The country about to be visited, it was also stated, was inhabited by a singular and exclusive people who for more than two centuries declined all intercourse with strangers, and to maintain their position had had recourse to measures, at variance with those of civilized nations. A paramount duty enjoined by Commodore Perry was that these prejudices should be overcome by friendly and conciliatory measures.

Anchorage was made off the city of Napa, the extreme southern end of the islands, May 26, 1853. The land, with its steep shores covered with dense verdure was a refreshing sight after the voyage along the Chinese coast under grey skies and through stormy waters. Commodore Perry had received very explicit instructions as to his personal and official attitude. He was to regard his official and national prestige upon all occasions, refusing to confer with any official of inferior rank who might be sent to him.

At Shanghai he decided to transfer to the *Susquehanna* which he found waiting there, and this ship with the *Mississippi*, *Plymouth* and *Saratoga* with the store-ship *Supply*, now comprised, which for that time, was an imposing squadron.

A steamship was an amazing spectacle in those waters, and with the other vessels, excited the wildest curiosity not unmingled with apprehension—the first squadron from the outside world to visit Napa. Within a very short time a Japanese officer was sent out and was directed to the flagship, orders having been given that all communications were to be made to its commanding officer. He was informed by that officer that the commander of the squadron, Commodore Perry, could not parley with a person of inferior rank. "This," Spalding observed characteristically, "was trying the dignity early"; but, he explained, "nothing else will answer in the East."

The flag which the Chinese—and not the Japanese—as has often been claimed—called "the flower-flag," they had never seen before and were at first puzzled by it. Strict orders had also been given that neither supplies nor gifts should be accepted until the treaty which the United States sought to negotiate had been agreed to. Consequently, under the impression that the ships' crews must be in need of food, boats were sent out the next morning with supplies of animals, fowls and vegetables as presents. These, in accordance with orders, and rather pathetically, had to be declined.

Finally the regent of the prince came with his suite and was received—"with a cheap salute of three guns only." The suite were shown over the ship, "so frightened when the great pistons began to turn that they scrambled down the ladder." The officers were more dignified and showed no surprise at the marvelous sights they were seeing for the first time. Their subordinates were frank in their expression of astonishment, giggling at a looking-glass and feeling behind it; lifting a wine glass to the forehead before

drinking; imitating the ticking of a watch which amused them greatly. The coins, gold and silver, in the purser's chest which were shown them, excited little interest.

A reconnoissance of the harbor of Napa was made without interruption, but the people were anxious for the ships to leave and were disturbed by the station flags set up on shore about which they gathered. The honesty of the people was a constant surprise—a virtue that has certainly not improved by a too close contact with “the outside barbarian.”

A house on shore had been asked for to be used as a hospital and for convalescents which was refused. But an officer and his men were allowed to occupy a building in the outskirts of Napa which had been a town hall to which the officers were carried in closed sedan chairs.

They, the Japanese, continued to hope for the speedy departure of the ships on the ground that the country did not produce more than enough for their own large population, and could not supply them with food. As Commodore Perry was aware that large quantities were exported, or given as tribute, he declined to accept this excuse, especially since the Americans had paid well for all that they received.

They also objected to his visiting the capital of the province to pay his respects to their prince, informing him that “they did not court the honor.”

As might be supposed the English had not looked with favor upon the American expedition—an adventure which they themselves had not attempted, although a garrison was maintained at Hong Kong and there were British warships, at the time, in Chinese waters.

But the outcome of the expedition was anticipated in this comment: “Be the impulse right or wrong it exists and as it will be most surely acted upon, it must not be ignored.” “The resistance of the Japanese,” it was declared, “would be of the most determined character. Great bloodshed and great misfortune will follow the opening of Japan.”

Not a word was said as to the real purpose of the expedition; the negotiation of a treaty of peace and amity that we might be able to protect American sailors wrecked upon the coasts of Japan, in whose behalf our request for protection had been long and stubbornly disregarded. The orders of Commodore Perry were

stringent and were strictly obeyed. There was no intrusion on the part of the Americans who confined themselves when ashore to the limits fixed by the Japanese. The native officials were not hurried or humiliated; their etiquette and customs were scrupulously respected. The only disagreement, of consequence, and that only temporary, was Commodore Perry's firm refusal to confer with a government representative of low rank, thereby discrediting himself and his country, as he knew, in the estimation of the Japanese.

After some delay, and in spite of the strong objections of the Japanese, Commodore Perry left anchorage at Napa and proceeded north to the Bay of Yedo, making thorough preparations for an attack should it be undertaken.

"As the ships approached the town of Uragawa (or Urago)," the author states, "about three o'clock a fort situated on a high hill sent up a shell high into the air, and in a little while after we heard the explosion of another. As they did not appear to be aimed at us were probably intended as signals not to come to anchor in their waters."

They were signals, for boats came out that were not seen at first, fully manned, and those at the oars in full uniform. An officer "with two swords" held up a letter and attempted to board the ship but was kept back by the sentinel. He was greatly enraged, and made a second attempt but was again prevented. Drawing and sheathing his sword he again held up his letter. A communication of the same sort had been thrown aboard the *Plymouth* warning them not to anchor, at their peril.

The ship kept on, notwithstanding this opposition, and let go their anchor within the harbor. In the evening the Lieutenant Governor of the province came out to the flagship, but was refused an audience with Commodore Perry, who, however, was represented in a conference which followed with the flag lieutenant. A cordon of Japanese boats immediately surrounded the ships for which the only explanation made was that "it was a Japanese custom." The Japanese officer was informed that "it was not an American custom, and would not be allowed and the boats must be withdrawn immediately or they would be fired on." He was also told that Commodore Perry had brought a letter from the Chief Magistrate of his country to the Emperor. An effort was made by the Japanese to effect the presentation of the letter at

Nagasaki; which was also resisted. Finally, after accepting the statement that it would require four days to send it to Yedo (Tokio) and receive a reply, this arrangement was accepted.

The Governor then took his leave, after which additional precaution was made to prevent attack during the night, should it be attempted. Meanwhile Japanese troops were collected. A well-constructed fort commanded the entrance to the harbor, the shore being protected by solid breast-works. While waiting the Emperor's reply to the President's letter, the work of putting the ships in fighting shape went steadily on—preparing thoroughly for action, should hostilities occur.

The *Mississippi* got under way and entered the straits following boats sent ahead to make soundings and to learn certainly if the capital could be reached, which was 20 miles from the first anchorage. While the Japanese continued to object, their guard boats endeavoring to prevent it, the work of sounding continued. No collision occurred, the Americans going on with deliberation and coolness.

Commodore Perry, in spite of all protests, continued to resist the orders that he was not to proceed to Yedo, though the Governor of Urago, himself, finally came on board and urged that his communication could be received only at Nagasaki. He was told by the Commodore that he had been instructed by the President to deliver the letter at Yedo and nowhere else. A compromise was finally arranged, that the Emperor's reply should be presented on shore at Urago, two days being required in which to get a proper building in readiness.

The Governor had brought to the flagship two interpreters. These men, with his Excellency, were shown about the ship. They, like the previous visitors, were close observers and "evinced more information than could have been expected, laughed and were untiring in their attention to—*Cherry brandy*." They recognized a daguerreotype and called it by name, pointed out the larger American cities on a map and knew the boundaries of Mexico—rather singular knowledge for a hermit nation. They finally wished to know why "*Four ships* of war were necessary to deliver one letter."

The required preparations for that ceremony were promptly made and on July 14 the historic landing took place. The ships in the harbor on the great occasion were the *Susquehanna*, the *Mis-*

issippi—both steamships, the *Plymouth* and the *Saratoga*. The boats were carefully prepared for landing, the seamen furnished with arms and ammunition; officers in undress uniform with cutlasses and revolvers. The boats were also supplied with anchors and after landing the men were ordered to haul off 50 feet from shore, and maintain a careful watch of proceedings, from that point.

The landing began at nine o'clock, the captain of the *Susquehanna*, which was the flagship, leading. With their customary taste, the Japanese had chosen a beautiful spot for the historic event, which was destined to effect far greater results for their advancement than any interests of our own. It was a secluded place on the shores of the bay, surrounded by an amphitheatre of hills, the snowy peak of Fuji Yama looming high over all. An American flag floated from the stern of each boat, and upon landing the men immediately formed into line, closely watched by the Japanese troops on duty and armed with spears and long brass-mounted muskets "with fuses ready coiled on their arms." The officers sitting on stools were armed with two swords—the badge of the samurai. A salute, 13 guns, was fired as Commodore Perry left the flagship and the bands which were with the boats played "Hail Columbia." The column of escort is thus described: "The marines in front, a stalwart sailor with a broad pennant, Commodore and staff; suite of officers; boxes containing presents, letters, etc.; two men over six feet tall each with a pike upon which American ensigns were fastened; sailors with bronzed muskets." All were in full uniform and were escorted by two Japanese officers to the building, where the ceremony took place." This too may be quoted as it was written: "The place of audience was limited in space and entirely open in the direction of the court, ornamented with gauze curtains as drapery. At the back of the room were representations of shubbery, and cranes wheeling in flight over it, while on the two remaining sides were hung large blue flags. . . . Overhead you looked up to the thatching and each rafter was marked with Japanese characters, as if the building had been originally constructed at some other place—probably at Yedo, and sent down for erection. On the left of the room as you entered by ascending one step, was seated the chief Japanese functionary, appointed by the Emperor to receive the President's letter—the Prince of Idzoo; beside him was the prince of the Province of Iwami; behind him quite a number of

two-sworded mandarins (samurai). The chief man was attired in a maroon silk robe with an over-garment of red, blue cloth socks with places left for the great toe." The interpreter of the Prince, the narrator continues, "squatted on the floor partially facing the chief, and the Governor of Urago, on his haunches, immediately in front of him. The Dutch language was used which was translated into English by the Commodore's clerk. A conspicuous object in the room was a highly lacquered red chest resting on eight feet, the lid confined by blue cords with tassels." After ceremonious greetings had been exchanged, beautiful rosewood boxes were brought in by Commodore Perry's attendants, gold mounted, with gold lettering in German text. These were placed on the lacquered chest—translations of President Filmore's letter in Dutch and Chinese, which were opened that the Prince of Idzoo might see them, after which he in turn gave Commodore Perry his credentials from the Emperor. The President's letter began with the conventional greeting: "Great and good friend." The Emperor was informed that the message was conveyed to him by an officer of the highest rank in the American Navy, commander of the squadron now visiting his dominion. His Imperial Majesty was assured that the President had no other object in view but to propose that Japan and the United States should live in friendship and have commercial intercourse with each other. He explained that the Constitution of the United States forbade all interference with the religious or political concerns of other nations, and that Commodore Perry had been expressly forbidden by the President to abstain from every act that could possibly disturb the tranquillity of his Imperial Majesty's dominion. He was aware that the ancient law forbade all foreign trade except with the Dutch, but it was believed that a change allowing free trade between Japan and the United States would be beneficial to both. If it was thought unsafe to abrogate the ancient laws wholly, it was suggested that they be suspended for a period of five or ten years. It was also stated, with much tact, that numbers of Americans were employed in whale fishery near the shores of Japan; that in stormy weather vessels were wrecked on his Imperial Majesty's shores. In such cases, it was asked that these unfortunate people be treated with kindness until a vessel could be sent to bring them away. He had also learned that there was an abundance of coal and provisions in the empire. American vessels

crossing the Pacific Ocean burned a great deal of coal and could not bring it with them. It was desired that they be permitted to stop in Japan and supply themselves with coal, provisions and water, for which payment would be made in money, or other things that might be preferred. It was suggested that his Imperial Majesty should name a port in the southern part of the island where American ships could stop for that purpose. This letter was signed "at the City of Washington in America, the seat of government, on the thirteenth day of November, one thousand eight hundred and fifty-two," by the President, Millard Fillmore.

As an evidence of his friendly intention Commodore Perry had brought but four of his smaller vessels. It was expected, however, that his Imperial Majesty would render such a return unnecessary, by acceding at once to the reasonable and pacific overtures of the President's letter. It was not surprising to learn that these communications should have been received in disappointed silence.

The Prince was somewhat reassured on being told that time for deliberation would be given, that the ships would return to China within a few days with any commands that he might have, and would not return until spring.

The President's letter was then placed in the lacquered chest, the tasseled cords tied, when the Governor of Urago rose and with a low bow signified that the audience was ended. The Americans then returned to their ships and sailed that afternoon, for the harbor of Urago, making soundings and surveys as they proceeded, to which the Japanese authorities, not unreasonably, still objected. A few presents had been exchanged, the Japanese officers refusing to part with their swords, which were splendid, well-tempered blades, or receive American swords in return.

On the 7th of August the *Mississippi* and *Susquehanna* arrived in Hong Kong after an absence of three months, other Chinese ports having been visited in the interval. The departure for Japan to complete the duty assigned them occurred on the morning of the 14th of January, 1854.

Special buildings had been again constructed for the final conference. The Japanese made one advance, agreeing to move them farther up the bay, on the shore nearer the anchorage of the American ships. This was agreed to and the site chosen was on the beach of the village of Yokohama. While the Japanese worked busily reconstructing the official buildings, the ships moved in

closer to shore and formed in a crescent, at their anchorage. During the preliminary preparations the Japanese officials who came off to the ships were hospitably received. A dinner was given on board the *Susquehanna*, now the flagship, to the Governor of Urago, at which the health of the Emperor was drunk by the Americans, the Japanese toasting the President of the United States in reply, all the officers having laid aside their swords. The visitors wrote their autographs in the Americans' books with but one refusal. This was a Prayer Book, which bore a frontispiece, an engraving of a cross. The landing was fixed for March 8, precautions being taken, as always, to guard against surprise. Commodore Perry was to be escorted by all the marines that could be spared from duty, with the bands from the *Susquehanna*, *Mississippi* and *Powhatan*. Four boats were sent from each ship carrying 40 seamen each, in addition to their proportion of marines and musicians. Half the captains were to remain on their ships, while those who went ashore were to leave a first lieutenant in command. An officer was in charge of the men from each ship, and one in charge of each boat. These officers were not to quit their divisions, or leave their boats. At 11 o'clock the line was formed and the boats pulled ashore. Commodore Perry then left the flagship, his departure announced by a salute of 17 guns. The Americans were formally received by a Japanese guard of honor, the common people kept back of ropes fastened to the surrounding trees shutting off any close approach to the buildings. The Commodore was received by the officers who had preceded him ashore, and with the escorting column, the bands playing American national airs, marched to the reception house which was close by, the Japanese Commissioners and members of the Council being in readiness to receive him. Five interpreters were present. When Commodore Perry arrived and was formally received by the Commissioners, the Japanese flag was run up on the *Powhatan*, with a salute of 21 guns, followed by a salute of 17 guns to the Japanese Commissioners, for which merited marks of respect they were very grateful.

The room, as on the first occasion, was tastefully furnished, with mats, hangings and beautifully embroidered screens. Low benches served as seats with a narrow table in front of each. The place was heated by charcoal fires in ornamental braziers placed in a row down the middle of the apartment. After they were seated,

the Japanese on the right, the Americans on the left—the place of honor—the Japanese chief interpreter for Commander Perry received a message from his prince, delivered it in Dutch, which was translated into English; “the Prince was glad to see him and hoped his health was better.” A similar greeting was returned. Five persons, including the captain of the squadron, then retired with the Commodore to another room where a private audience was held. The momentous interview, destined to change the history of Japan incalculably, continued three hours, during which a reply to the President’s letter was read. In this communication he was informed that the Emperor, who had been ill when Commodore Perry first visited Japan, had since died, and his successor had ascended the throne. The new ruler having much to engage his attention on his recent accession, there had been no time to attend to other matters thoroughly. Furthermore, as he was bound to obey the old laws, he could not bring about any change in them. The Russian Ambassador, it was explained, had recently arrived at Nagasaki to communicate a wish of his nation, but had left because no answer would be given any nation expressing a similar wish. They would, however, recognize its urgency, comply with the proposal of the United States Government concerning supplies of wood, water and provisions, and the saving of ships and their crews in distress. When informed which harbor his Excellency, Commodore Perry, might select, it should be prepared. It was estimated that such preparation would require about *five years!* A commencement would be made with the coal at Nagasaki by the beginning of the next Japanese year, February 10, 1855. Having no precedent in respect to coal, it was requested that his Excellency would furnish them an estimate, and, after due consideration, the request would be complied with, if not in opposition to their laws. Commodore Perry was asked “just what was meant by ‘provisions’ and how much coal would be required.”

It was promised that anything further wanted by the ships from the products of the empire would be supplied, the prices of merchandise and articles of barter being fixed—by the chief interpreter, Monyama Yeuoske, and one other. The points settled, the treaty would be concluded and signed at the next interview. The Commissioners were ready to discuss the various points in the President’s letter received the year before; to receive any further propositions from Commodore Perry. In modifying their

laws of seclusion the Emperor would rely upon the friendliness of the Americans and as such negotiations were novel to them, the Japanese, would confidently trust to his superior experience, generosity and justice. A draft treaty was given the Commissioners in English, Dutch, Chinese and Japanese, which was promised proper consideration, the Commodore being shrewdly reminded that the Japanese, unlike the Americans, could not act rapidly. This arrangement made, the Commissioners and Commodore Perry then returned, and tea and confections were served the officers of the escort.

A seaman had died on board the *Mississippi* two days before the conference and a request for a burial place was made. It was refused, but it was suggested that the body be taken to Urago, 26 miles south, and they would there send it to Nagasaki. Commodore Perry would not consent to this and the Commissioners finally permitted the burial on shore near the anchorage. It was an event which attracted thousands of spectators, and was conducted with the utmost solemnity, of which the officiating chaplain left a graphic account. The first of the service was read from the gangway of the ship, after which the body was taken ashore. In the first of two boats, both with flags at half-mast, were the chaplain in his surplice, and the captain of the marines with the guard of honor, who were received by the Governor of Urago and interpreter at the landing-place. The marines, upon landing, formed in line and received the body with presented arms. Then with muffled drums and fifes playing the dead march, the coffin borne upon the shoulders, the escort of seamen, now with arms reversed, the dead man was carried to his grave. "I saw one woman hold up her little child to see me," the chaplain wrote, "and the thought passed through my mind that if it should chance to live to maturity it would probably see many wonderful changes in Japan." A Buddhist priest in his vestments came down the steep steps of a temple in the line of march, and took his way to the burial place. Japanese officials stood close to the Americans while the committal was read and the priest placed himself near them behind his little table on which there were burning incense and a number of tapers. The interpreter explained that the priest had come to the burial "as a compliment." When the Christian service ended, the Buddhist began his, telling his beads, bowing and read-

ing his prayers, and was left there when the officers and escort returned to their ship.

The text of the treaty was under consideration for more than a month, during which the officers and men from the squadron made frequent visits ashore, sight-seeing and giving entertainments to the Japanese on board the ships. On the 13th of March valuable presents were sent ashore by the captain of the *Macedonian* and a suite of officers, for the Emperor and Empress. Among the most important of these for the Emperor were a miniature railway with steam engine, a magnetic telegraph, a printing press, a set of Audubon's "American Ornithology" splendidly bound, agricultural implements with all the modern improvements, a stove and rifles, pistols and swords. Those for the Empress included a telescope and lorgnette, a gilded toilette box, a scarlet velvet dress, a handsome set of china, a parlor stove, and clock and a *box of fancy soaps!* Considering the taste and elegance of the dress of Japanese women of the higher class, and indeed of all classes, and their custom of frequent bathing the scarlet velvet dress and box of fancy soap were somewhat open to criticism.

With the 12 articles of the treaty was a provision that there should be a perfect, permanent and universal peace between the United States on one part, and Japan on the other part, and between their people respectively, without exceptions of persons or places.

The four languages mentioned were employed in the negotiations of the treaty which was duly signed, the objectionable points apparently having been satisfactorily explained. Commodore Perry intimated, his chief business dispatched, that he would go up to Yedo, "to salute the Emperor," if the steamships could not reach the capital. This was objected to, and the Japanese were reminded that the objection should have been included in the treaty. They also demurred at the inclusion of the names "Lord Jesus Christ," as terms no doubt considered inimical to their own religion, but this objection was also disregarded. Hakadade was not to be visited until 50 days after the date of signing the treaty. The Japanese expressed anxiety as to the possible movements of the English and French, and asked Commodore Perry if he thought that they too would come when his squadron had sailed. To this he merely replied that he did not know.

In spite of the strong objection of the Japanese Commissioners which they persistently maintained, Commodore Perry would not

relinquish his determination to visit Yedo. The squadron was signaled to get under way, the *Mississippi* leading. Three of the Japanese interpreters came out to the ships immediately, greatly excited, and not without reason. The Commodore was informed that for not preventing it, or remonstrating, when the ships arrived in the Bay of Yedo they would be forced immediately to perform the harikari (disemboweling themselves with the sword) to atone for their breach of duty and to save their honor and that of their families. Commodore Perry, knowing this to be true, and not wishing to be responsible for such a tragedy, compromised by agreeing to go only within sight of the capital and then return immediately. Even this modification of his plans did not altogether allay their fears. The ships, the *Vandalia*, *Lexington*, *Chesapeake*, *Pawhatan* and *Mississippi*, left the Bay of Yedo on the 18th of April.

Throughout the stay of the squadron the desire of the Japanese for information was insatiable, on every imaginable subject pertaining to the ships, the United States, its laws, customs and products, and the officers were beset by questions, orally and in writing.

Notwithstanding Spalding's deep personal dislike for him, and his acrid criticisms, the great task assigned Commodore Perry was well and successfully performed, as is shown throughout the entire narrative. It resulted in radical changes in the history of Japan and in many aspects of its civilization, the main provision of the treaty standing unaltered to this day.

The work finished, the squadron returned to Chinese waters. The *Mississippi*, which had been reserved by Commander Perry as the flagship, arrived in the harbor of Hong Kong on the 29th of July and was joined by the *Susquehanna* from Nanking. The *Macedonian* with the other ships arrived shortly afterwards and all sailed thence by different routes for America, Commodore Perry receiving permission to return by a British mail steamer by the way of England. Both in England and in the United States, he was received with the distinguished honors he had earned and merited.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AMALGAMATION

By COMMANDER N. H. GOSS, U. S. Navy

The principle is well established that a homogeneous squadron of vessels can operate more efficiently than a heterogeneous one. It would also seem then reasonable that the same principle could be applied to personnel.

There has always been, regrettably, a certain amount of so-called line and staff friction. If this could be removed by amalgamation, it would appear the part of wisdom to do it.

Certain of the staff corps are inherently different, on account of their training and duties, from the line and could never be amalgamated with it. Others have a common origin and similar early training.

In the line already we have engineers, ordnance specialists, electrical specialists and radio specialists. From this system the navy and the country behind it derive great benefit. These officers come out of the Naval Academy, go to sea, are then given special training along the lines they desire and for which they have shown special capability, and after this training is completed, continue to go to sea. They remain a part of the line. They retain the practical seagoing point of view, keep in touch with active conditions afloat, and by means of their special training are better qualified for shore duty along their special lines.

The construction corps follows this same line up to a certain point. They have a common Naval Academy training, an early sea experience, and are sent ashore for special training.

Here the homogeneity stops. They do not go to sea thereafter, do not remain in active touch with seagoing conditions, and inevitably drift away from the common general interest, towards a special or corps interest. They nominally pursue their specialty ashore, but actually, only a very small per cent of them are engaged in duties which fully utilize their specialized training, most of

them being employed in general hull division work at navy yards and inspection duty.

There is nothing in the world that takes the place of practical sea experience.

The great benefit which the navy and country derive from its sea-going engineer, ordnance and electrical specialists is not fully equalled by the results obtained from members of the construction corps. The former go to sea, retain the necessary practical and seagoing point of view, come ashore, are assigned to their specialty, and when ships come to the yards, or ship's requests come to the bureaus, they are at home at once, and in sympathy with the needs afloat because they have experienced the same needs and conditions themselves.

The construction corps on the other hand are handicapped. They do not go to sea. Their early sea training was so slight, and of such a subordinate character that they tend to lose the seagoing point of view almost entirely, and hence there arises a tendency to substitute a corps point of view instead of a common seagoing point of view.

For example, when a ship comes to the navy yard for repairs which requests give the captain and heads of departments more trouble, the engineering requests, or the C. & R. requests? Does it not often take personal interviews with the construction officer, appeals to the commandant, or maybe appeals to the chief of operations to get the C. & R. work through, while the machinery division work goes through as a matter of course?

Can it be said that our propelling machinery, our electrical equipment, our ordnance, our fire control, which are designed and controlled by seagoing officers, compare unfavorably with the hulls of our ships?

If the practice of depending on seagoing specialists for engineering, electrical and ordnance work is so successful, is it not reasonable to expect that ship design would be equally so?

Can it be said that hulls are more difficult to design than engines, turbines and guns? Can hull division work at a navy yard be more difficult or exacting than aligning engines and pumps, boring cylinders, fitting bearings, installing guns, adjusting fire control instruments?

Our propelling machinery, our armament and fire control, our radio are continually improving. Are our hulls, structural fittings,

interior fittings, boats, furnishings and general accommodations improving equally? And could they not be expected to improve more if their designers were also practical seagoing men?

Past experience has surely shown that there is the greatest reason and should be the greatest desire, to avoid even the appearance of a line and staff controversy.

All serve the same master, the people of this country. To try to avoid this is the purpose of this article.

Why should not the construction corps be amalgamated with the line, the common mother?

Why should not the construction officers receive their special training, as at present, be assigned hull division and C. & R. work when on shore, but go to sea as the other specialists do, and thereby keep in touch with seagoing conditions?

There would then be no navy versus construction corps problem, with its inherent controversies, lack of co-operation and consequent lessening of efficient results.

All would have a common interest, and it would appear that the general efficiency of the navy and its value to the country could not but be improved.

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OPERATIONS ASHORE IN THE DOMINICAN
REPUBLIC

By MAJOR EDWIN N. McCLELLAN, U. S. M. C.

The Dominican Republic was established in February, 1844, and, except for a period of about four years beginning in 1861 during which time Spain re-established her authority, the sovereignty of the Republic has been maintained.

Duarte was proclaimed President of the Republic by the North, but this was opposed by Santana, and after a struggle Santana was declared Chief of State with dictatorial powers, and in November, 1844, was elected President. He resigned on August 4, 1848, being succeeded by General Manuel Jimenez, who entered office on September 8, 1848, and resigned in May, 1849. Santana now headed the government with a title of "Libertador."

Colonel Buenaventura Baez became President on December 24, 1849, and upon the expiration of his term of office Santana was again elected, entering office on February 15, 1853. In 1854, General Manuel de Regla Mota was elected the first Vice-President. Santana retired on March 26, 1856, and Mota became President, soon after resigning and Baez, who had been elected Vice-President, became the President.

In 1858, General José Desiderio Valverde was elected President by one faction and thus there were two governments in the country. Baez gave up office on June 12, 1858, and General Santana again controlled the government, entering the office of President on January 31, 1859. For approximately four years prior to July 11, 1865, Spain asserted her sovereignty over the Dominican Republic, but on the above-mentioned date the Spanish flag was lowered for the last time in Santo Domingo. During the period in which Spain attempted to dominate the Dominicans, provisional governments were set up.

On September 14, 1863, General José Antonio Salcedo was elected President, but he was deposed in favor of General Gaspar Polanco, Salcedo being murdered. In March, 1865, General Pedro Antonio Pimentel was elected President.

In a short while General José Maria Cabral was proclaimed Protector of the Republic. Opposition soon arose against Cabral, and Baez was elected to the Presidency. An insurrection broke out on May 1, 1866, and before the end of the month Baez retired, Cabral being elected President. Cabral was deposed on January 31, 1868, and Baez on May 4, 1868, assumed charge for the fourth time. Baez bowed before a revolutionary storm that broke out in November, 1873, and capitulated on December 31, General Ignacio Maria Gonzalez becoming Provisional President early in 1874, and elected President on April 6, 1874, but resigned on February 23, 1876, as a civil war became imminent. Ulises F. Espaillat became President on April 29, 1876, but was ousted by General Gonzalez on October 5, 1876. General Buenaventura Baez became President for the fifth time when he overthrew Gonzalez in December, 1876. Baez retired on February 24, 1878.

Two governments were now set up with General Ignacio Maria Gonzalez and General Cesareo Guillermo as Presidents, but on April 13, 1878, the latter became the Provisional President of the entire country, and the former being declared constitutional President on July 6, 1878. Gonzalez abdicated on September 2, 1878, and Jacinto de Castro acted as President until September 29, 1878, when he was succeeded by a Council of Ministers headed by Guillermo, who on February 28, 1879, became the constitutional President. General Gregorio Luperon led a revolution against Guillermo, who surrendered on December 6, 1879, and Luperon acted as Provisional President until Father Fernando de Merino was elected President on September 1, 1880. General Ulises Heureaux became President and served from September 1, 1882, to September 1, 1884, being succeeded by Francisco Gregorio Billini, but the latter resigned on May 15, 1885, and was succeeded by Alejandro Woss y Gil.

In July, 1886, a formidable insurrection broke out which resulted in the re-election of Heureaux as President on January 6, 1887. Heureaux entered a new term of office on February 27, 1889, again in 1893, beginning his final term on February 27, 1897. Heureaux was killed by Caceres in July, 1899, Juan Wenceslao

Figuerero, the Vice-President, succeeding him, but soon resigning as a result of a successful revolution headed by General Horacio Vasquez, and Juan Isidro Jimenez was elected President on November 20, 1899. In May, 1902, President Jimenez retired and fled to Porto Rico, Vasquez becoming Provisional President.

The next President was Alejandro Woss y Gil, at first Provisional President and inaugurated constitutional President on June 20, 1903, but soon gave way, and in November, 1903, General Carlos F. Morales assumed the Presidency. Morales was elected constitutional President on June 19, 1904, but resigned on January 12, 1906, Vice-President General Ramon Caceres assuming control. Caceres was elected constitutional President on July 1, 1908. Caceres was assassinated on Sunday, November 19, 1911, and General Eladio Victoria was selected Provisional President, entering office December 6, 1911. In a public election, Victoria was elected President in February, 1912. He resigned November 26, 1912, and Monsignor Adolfo A. Nouel entered the office of Provisional President for a period of two years on December 1, 1912. He resigned on March 31, 1913, General José Bordas Valdez being elected Provisional President for a period of one year and assuming office April 14, 1913.

A revolution immediately broke out but on the promise of a free election the insurgents laid down their arms. On the day the one-year term of President Bordas ended, April 13, 1914, another revolution started and spread rapidly to all parts of the Republic. Fighting occurred at Moca, Las Vegas, San Pedro de Macoris, San Francisco de Macoris, and Santo Domingo City. Monte Cristi and Santiago were comparatively quiet owing to the fact that they were dominated by Desiderio Arias who was against the government. The day his one-year term ended found President Bordas on top of the hill overlooking Puerto Plata with a large armed force, having arrived there with about 600 men on two Dominican cruisers, the *Independencia* and *Jacagua*. These men were landed but found Puerto Plata and the insurgents well intrenched, and a hard problem to solve. Considerable fighting occurred and many casualties were suffered on both sides.

BEGINNING OF FINAL INTERVENTION BY THE UNITED STATES

It was at this time that the beginning of the final intervention by the United States in Dominican affairs may be said to have com-

menced, for the senior naval officer present ordered all firing to cease, and when the Dominican cruisers attempted to bombard Puerto Plata the U. S. S. *Machias* trained her guns on them and their firing was promptly suspended. When the engaging force attempted to attack the town in the neighborhood of the railroad station the U. S. S. *Machias* opened fire on that section, one three-pounder shell passing through the Ferrocarril-Central Building. After that no further fighting occurred except that of a guerilla nature on the outer lines and detached posts.

DOMINICAN FORCES DISBANDED AND PRESIDENT SELECTED

On August 30, 1914, General Vidal, the leader of the revolutionists, obeyed an order of Captain Edward W. Eberle, U. S. N., the senior naval officer present in Dominican waters, to disband his forces. An American commission supported by the presence of a large naval force, including the U. S. S. *Hancock*, carrying the Fifth Regiment of Marines under Colonel Charles A. Doyen, U. S. M. C., successfully terminated the revolution.

A Provisional President, Dr. Ramon Baez, a son of former President Buenaventura Baez, was elected on August 27, 1914, and finally, on December 5, 1914, Juan Isidro Jimenez, was elected constitutional President, the election throughout the Republic being supervised by the personnel of the naval service and the Fifth Regiment of Marines. Jimenez remained in office until May 6, 1916, when he resigned, as the clouds of another revolution gathered, and the Council of Ministers took over the control of affairs.

NAVAL FORCES LAND AT SANTO DOMINGO CITY

On April 28, 1916, the Acting Secretary of the Navy informed the senior naval officer present on the U. S. S. *Dolphin* at Port-au-Prince, Haiti, that a report had been received from the American Consul at Santo Domingo City to the effect that conditions there were unsettled and that the presence of a naval vessel with a landing force would be beneficial.

At 9.30 a. m., April 30, 1916, the senior naval officer present issued orders for two companies of the expeditionary force stationed at Port-au-Prince, Haiti, to embark on the U. S. S. *Prairie*, which vessel was directed to proceed immediately to Santo Domingo City, its commanding officer being authorized to act

as senior naval officer present at Santo Domingo City upon arrival.

On May 5, 1916, two companies of marines landed from the U. S. S. *Prairie* at Santo Domingo City and occupied the American Legation, the American Consulate, and Fort San Geronimo. This force was later augmented by seven additional companies of marines.

On May 6, 1916, the senior naval officer present at Santo Domingo City reported that he considered the situation serious, that two companies of marines were guarding the American Legation, that officers and marines from the U. S. S. *Castine* were at the Haitian Legation, that the marines were holding Fort San Geronimo, that it might be necessary to bombard Santo Domingo City, and that Dominican troops had deliberately fired upon the American Legation and continued the fire although the American flag was flying in plain view of the gunners. On this date President Jimenez resigned.

REAR ADMIRAL CAPERTON ARRIVES AND DELIVERS ULTIMATUM TO REVOLUTIONISTS

The U. S. S. *Dolphin*, carrying Rear Admiral William B. Caperton, U. S. Navy, arrived at Santo Domingo City on May 12, 1916, and he assumed direct charge of the situation. About May 13, 1916, Rear Admiral Caperton reported that he had had a conference with the American Minister and four members of the Dominican Congress in which the latter stated that they desired to resume their portfolios, that the Dominican Congress desired to hold an election of a new President, and that they would support any President legally elected.

About May 14, 1916, Rear Admiral Caperton conferred with General Desiderio Arias, the leader of the revolutionists, in company with the American Minister, and informed Arias that the rebels in Santo Domingo City must be disbanded and deliver their arms to American forces by 6.00 a. m., May 15, 1916. Foreign officials were also informed that it was probable that American forces would attack Santo Domingo City at daylight, May 15, 1916.

SANTO DOMINGO CITY OCCUPIED

On May 15, 1916, United States naval forces, consisting of 375 marines and 225 bluejackets occupied Santo Domingo City,

entering at daylight and taking possession without casualties. General Arias was reported with an armed force in the vicinity of Santo Domingo City.

The U. S. S. *Panther* with a force of marines under Colonel Theodore P. Kane on board arrived at Santo Domingo City on May 22, 1916, and these marines landed about May 23, 1916, the bluejackets being returned on board ship. Fort Ozama was occupied.

About May 25, 1916, General Vidal, the rebel leader who had figured prominently in the 1914 rebellion, was reported to have departed for Azua. On the next day the senior naval officer present reported that Arias with his forces had left the vicinity of Santo Domingo City for Santiago.

Rear Admiral Caperton on May 27, 1916, reported the forces under his command distributed as follows:

Santo Domingo City: Four companies of marines and two of marine artillery. U. S. S. *Memphis* and U. S. S. *Dolphin*.

Ocoa Bay: U. S. S. *Reed* and U. S. S. *Hector*.

San Pedro de Macoris: U. S. S. *Castine*.

Romana: U. S. S. *Flusser*, with 30 bluejackets on board from the U. S. S. *Prairie*.

Sanchez: U. S. S. *Salem*, to maintain radio communication.

Puerto Plata: U. S. S. *Sacramento*, with two companies of marines.

Monte Cristi: U. S. S. *Panther* and U. S. S. *Lamson* with two companies of marines.

U. S. S. *Prairie* en route to Fort Liberte, Haiti, to return to Santo Domingo City.

Three oil-burning destroyers on North Coast.

PUERTO PLATA OCCUPIED

The situation became more critical with the increased activity of the rebels in the interior, and the dissatisfaction of the population in the coast cities. It thus became necessary for the United States to take further initiative, and on May 30, 1916, the senior naval officer present reported to the Secretary of the Navy that he had consulted with the American Minister and in an agreement with him to preserve peace and maintain constitutional government, had directed the landing of United States naval forces at Puerto Plata

and Monte Cristi. During the latter part of May, the forces in Santo Domingo were reinforced from the United States.

Accordingly on June 1, 1916, a naval battalion consisting of bluejackets and the marine detachments from the U. S. S. *Rhode Island* and U. S. S. *New Jersey*, landed under fire in open boats from the U. S. S. *Sacramento*. Fort San Felipe was captured and Puerto Plata occupied. Captain Herbert J. Hirshinger, of the marines, was killed instantly during the landing, while the enemy suffered to a greater extent in killed and wounded. Two companies from Santo Domingo City reinforced those at Puerto Plata, on June 5, 1916.

On June 8, 1916, the senior naval officer present reported that he had directed the commanding officer of the U. S. S. *Sacramento* to take charge and supervise the administration of the railroad at Puerto Plata and further reported that the rebels were preparing Santiago, in the interior, for a siege. He stated further that it was his intention to hold Santo Domingo City with the landing force of the U. S. S. *Memphis* and to send an expedition of marines to Santiago.

BATTLE OF GUAYACANES AND OCCUPATION OF SANTIAGO

In the meantime, on June 6, 1916, a large force of marines had landed at Monte Cristi; and on June 4, 1916, the Fourth Regiment of Marines proceeded from San Diego, Cal., arrived at New Orleans, La., and it and an additional company embarked on the U. S. S. *Hancock* on June 11, 1916, and disembarked at Monte Cristi on June 21, 22, 1916. Colonel Joseph H. Pendleton, U. S. Marine Corps, was placed in command of all forces operating on shore in Santo Domingo.

The plans for the pacification of Cibao Valley and the occupation of Santiago provided for two columns of marines to march in the direction of Santiago, one to proceed by railroad from Puerto Plata and the other to march from Monte Cristi, joining at Navarette. Colonel Pendleton was in command of the entire operation.

The expeditionary force from Monte Cristi under command of Colonel Pendleton, leaving that city on June 26, 1916, advanced along the highway, which was little more than a muddy trail through the jungle of cactus and thorny brush. On June 26, 1916, a water detail was attacked at Lagunas and one marine was

wounded by the enemy. On the next day the enemy was encountered at Trencheras and one marine was killed and five wounded. On June 28 the column was again fired on several times, one marine being wounded, and on the following day small bands of the Dominicans were driven off. On June 30 the column encountered brisk fire from the enemy at Dona Antonio Alta, which was captured, one marine being mortally wounded. The enemy was also routed at Hautillo Palmas on this date. The decisive engagement of the advance took place on July 3, 1916, at Guayacanes, near Esperanza, where the marines, after a stubborn fight, carried a strongly intrenched position defended by a large force of insurgents. One marine was killed, and one officer (Captain Russell B. Putnam) and nine marines were wounded, while the enemy's losses were very heavy. First Sergeant Roswell Winans and Corporal Joseph A. Glowin were awarded medals of honor for extraordinary heroism during this fighting. Navarette was reached on July 4, 1916.

Major Hiram I. Bearss assumed command of the Puerto Plata column on June 28, and with one company proceeded immediately to Lajas, to which place the remainder of his force had already advanced, having left Puerto Plata two days before under Captain Eugene P. Fortson. The railroad was in poor condition, bridges had been destroyed, and the mountainous terrain made progress difficult and slow. On June 29, 1916, the column attacked the enemy who were in a strong position at Alta Mira. After an engagement lasting about half an hour in which the infantry and a three-inch gun were engaged, the rebels were routed. During this skirmish Second Lieutenant Douglas B. Roben and one trumpeter were wounded. After a short advance the enemy were discovered in a strong position near a tunnel 300 yards in length. Under the fire of the three-inch gun the infantry advanced, dispersing the armed natives, and dashed through the tunnel. Upon emerging from the tunnel the marines discovered the enemy retreating at full speed towards Santiago. After making extensive repairs to the railroad and to a bridge, this column joined the main column at Navarette on July 4, 1916.

Colonel Pendleton met the Peace Commissioners from Santiago on July 5, 1916, who agreed to a peaceful entry into the city. The outskirts of Santiago were reached early on July 6, 1916, and the

city entered and Fortaleza de San Luis occupied about 3.30 p. m. the same day.

All the insurgent Dominicans eventually dispersed or surrendered, and General Desiderio Arias, the chief leader, himself submitted to American control, which became absolute throughout the Republic.

PLACED UNDER MILITARY ADMINISTRATION OF UNITED STATES

The period of reconstruction then commenced. Detachments of marines were scattered throughout the Republic to preserve order and enforce the law. Bandits were relentlessly pursued and their organized bands broken up.

On July 18, 1916, Rear Admiral Charles F. Pond relieved Rear Admiral William B. Caperton.

The Dominican Congress, on July 25, 1916, elected Dr. Francisco Henriquez Carvajal as temporary President for a period of six months, with the condition that he would not seek re-election at the general elections. As the term for which Henriquez had been elected drew to a close it became evident that he intended to run as a candidate for re-election at the general elections, and this precipitated a crisis.

On November 29, 1916, Captain (now Rear Admiral) Harry S. Knapp, who had relieved Rear Admiral Pond on November 22, 1916, issued a proclamation, declaring the Dominican Republic under the military administration of the United States. This proclamation stated in part that the purpose of the occupation was to restore good government, peace, and prosperity to the Dominicans and that "The military occupation is undertaken with no immediate or ulterior object of destroying the sovereignty of the Dominican Republic, but, on the contrary, is designed to give aid to that country in returning to a condition of internal order that will enable it to observe . . . the obligations resting upon it as one of the family of nations." The military government took over the entire Republic and all its functions, with practically no opposition. President Henriquez, now the ex-President, left Santo Domingo early in December, 1916, for Cuba.

The military government proceeded to organize the finances, to pay arrears in salaries, to subdue several bandits who held back in declaring their allegiance, to confiscate all arms, to construct

public works, particularly roads, to organize a police force, and to improve the country generally. The heads of the executive departments under this form of government are officers of the navy and marine corps. Rear Admiral Harry S. Knapp, was appointed the first governor. Detachments of marines took over all military posts throughout the Republic.

THE GUARDIA NACIONAL DOMINICANA

By an order of the governor dated April 7, 1917, a sum of money was set aside for the organization of a constabulary force to be called the *Guardia Nacional Dominicana*, to take the place of the Dominican army, navy, and police. The organization of this force was promptly accomplished, and the *Guardia Republicana* was soon absorbed. The act of February 11, 1918, was passed by the United States Congress empowering officers and enlisted men of the United States Navy and Marine Corps to serve under the Dominican Republic and also to receive compensation and emoluments from that government. This act authorized the employment of the personnel of the navy and marine corps with the Dominican Government, similar, in general terms, to the conditions outlined in the act of Congress permitting such officers and men to accept employment under the Government of the Republic of Haiti.

Rear Admiral Thomas R. Snowden relieved Rear Admiral Knapp as governor of the Dominican Republic on February 25, 1919.

IMPORTANT MILITARY EVENTS

The principal military events occurring in the Dominican Republic since the important operations ending with the occupation of Santiago, have been: the capture of Juan Calcano at Higüey on August 24, 1916; the capture of Ramon Batista at Duarte, on October 24, 1916, in accomplishing which, Captain William W. Low and Sergeant Frank L. Atwood were killed, and First Lieutenant Victor I. Morrison, injured; capture of the Fortaleza at San Francisco de Macoris on November 29, 1916, made necessary by the opposition of Governor Perez of that place to the military administration by the United States, in which operation eight marines were wounded, and First Lieutenant Ernest C. Williams, was awarded a medal of honor for extraordinary heroism; the skirmish between followers of ex-Governor Perez and a detach-

ment of marines early on December 4, 1916, about six miles from San Francisco de Macoris, in which the Dominicans were dispersed, but Captain John A. Hughes, of the marines, was severely wounded in the leg; the killing of Second Lieutenant James K. Bolton, and wounding of Captain John R. Henley, at San Pedro de Macoris, on January 10, 1917; an engagement at Porvenir, near San Pedro de Macoris, on January 20, 1917, in which one marine was killed and one wounded; the capture of Chacha on January 23, 1917; the seven-hour engagement of a large force of marines and guardias with Dominicans at Las Canitas, on April 7, 1917, three marines being wounded; the surrender of Vicente Evangelista, *alias* Vicentico, at Seibo, on July 3, 1917; the destruction of Olivorio's stronghold in Mount Colorao on January 19, 1918; the engagement on August 13, 1918, of a marine patrol with the enemy near Hato Mayor, in which three marines were killed and one wounded; the operations of marine aviators against bandits near Mata de la Palma, on July 23, 1919, and at Majia and Sierra de Agua, on August 4, 1919; the killing of Second Lieutenant Stephen A. Norwood, near Le Tumbe on the Haitian border, on August 9, 1919; and the killing of Second Lieutenant Richard G. Howard from ambush on August 9, 1919, at Yuma.

MANY SKIRMISHES; CASUALTIES

There have been a great many skirmishes and contacts with Dominicans which have not been officially reported, but the records of the naval service disclose that during the period June 1, 1916, to August 9, 1919, there have been at least 116 distinct and actual skirmishes between the marines and Dominicans in the various parts of the Republic.

Five officers have been killed in action or died of wounds received in action with the Dominicans, and seven officers have been wounded in action, during this period. Nine enlisted men have been killed in action or died of wounds received in action and 34 have been wounded in action. This makes a total number of 55 battle casualties, and for the sake of clarity it is stated that this number does not include deaths or wounds resulting from accident and disease.

DISCUSSION

Promotion in the Navy

(SEE PAGE 7, WHOLE No. 215)

CAPTAIN J. S. TAYLOR (Medical Corps), U. S. Navy.—Lieut. Commander Vossler's able paper commands universal attention. To combine the three methods of promotion is perfectly feasible. At the first reading I thought it supplied the solution for the whole matter; at the third I realized that to combine the various systems might result, not in neutralizing the inherent defects of each, but in giving us instead three sources of possible errors due to the almost ineradicable element of human weakness. Is it not true that almost any scheme would be satisfactory if it could be operated with absolute fearlessness, by people fully informed and free from personal bias?

The statutory boards for promotion by seniority were intended to promote only the fully deserving. That is undoubtedly what the law contemplated. If they had maintained a higher standard and had made more comprehensive estimates of fitness there would have been no need for plucking boards except to *accelerate* elimination of the undesirable. Was not the plucking system, ostensibly to increase the flow of promotion, an outgrowth of the shortcomings of the examining boards? Seniority was intended to furnish the *opportunity* not the *assurance* of promotion. If there had been real uncertainty, real uneasiness about ability to qualify under the old system would it have fostered "perfunctory and indifferent performance of duty" and offered "no greater reward to efficiency than to inefficiency"?

By a plucking board we stultify ourselves. We admit that our examinations are a form: that "once in the service always in the service" unless some gross misdemeanor disqualifies. If from lieutenant to rear admiral every examination jeopardized our hold on a life job there would be inducements to endeavor, corresponding to the desperate competition that compels people in civil life to "deliver the goods." The law contemplated that boards of officers and gentlemen under oath to determine physical, moral and professional attainments would determine both fitness and unfitness and require no other board to come along and "mop up" for it.

That is the way it looks to the outsider and we must consider the outsider not only because he makes the law and holds the purse strings but because we are his trusted agents. We have other duties to the country besides defending it against the enemy of the moment. If we are to constantly prepare ourselves and our successors to display self-sacrifice and devotion so as to be victorious in every form of peril that assails our

country we must maintain for ourselves and the country the highest standard of honor and integrity. Promotion by seniority, as we used to have it, did not come up to specification. Men were promoted that should not have been promoted. There were two reasons. Sometimes we were in doubt about the justice of throwing a man out into the cold world. We were always loath to do it. We did not do it. The task was too hard. Selection came in and now among the men who are not selected there are certainly a few who have no reason to growl because, instead of being selected up, they should have been selected out, only we don't tell them so. The honest, straightforward thing is to select out when incompetency presents itself for promotion by seniority. But to relegate old shipmates and friends to penury and starvation is flatly beyond us. This is the essential weakness of promotion by seniority. Another and very real obstacle to efficient working of the seniority system lies outside the service. We know full well that if examining boards made wholesale eliminations there would be a howl from the public and enormous pressure would be brought to bear to obtain re-examination and reinstatement, etc. This seems to me a less obvious but most valid objection to attempting to bolster up the seniority system which I had always strongly favored up to the time of being asked to discuss this paper. Promotion by seniority must go by the board unless the government can relieve us of the executioner's duty by making at least a modest provision for the wholly disqualified, basing it on length of service.

Promotion by seniority did not put the best man at the top of his grade. This is desirable if we can determine his superiority. To do this we must have a totally different sort of fitness report. It should be *constructive*, devised entirely without reference to previously employed records, limited to reports of special, peculiar and specific commendation for unusual excellence. If "selection" is to be combined with "seniority" it should not take a man out of his grade but merely place him at the top of it. Otherwise the asset of experience is liable to be wholly sacrificed.

Whether an improved "selection" supersedes other systems or is retained as a feature of a composite one, heroism should not be an unqualified passport to promotion. I admire, I venerate the young doctor who can paint iodine on a wound or apply a first-aid dressing under fire and tremble to think that I might not make good in such a contingency. He deserves medals, honors, money, etc., but coolness under fire in doing a simple thing does not argue competency for difficult and highly technical performances under other circumstances—surgery, diagnosis, treatment of serious cases, administrative ability, all the enlarged opportunities conferred by promotion. The man who plunges into an engine room full of live steam deserves a medal of honor but he is not thereby proved competent to have charge of an engine room on a full-speed trial or in the hour of battle. He might inspire his division but hazard the ship and turn the scale against us in an even fight.

The word "may" in Lieut. Commander Vossler's proposed enactments introduces a serious element of weakness. Why should the board have an option in weeding out the undesirables if they can be discovered? Why

have a numerical limitation of the men to be eliminated? It seems contrary to business principles to say: "We authorize the board to remove, if it chooses, some of the undesirables but not all." Have we not in these restrictions a door for the entrance of favoritism, personal bias, outside influence? There are six incompetents. The board for its own tacit reasons does not reach the sixth man or decides, more prudently, to eliminate none. Whose friend is he? Whose protégé?

I do not understand the technical requirements for reasonable flow of promotion but it is a safe rule that good practice depends on sound principles. It is a sound principle that: (1) All men of reasonable deserts should be promoted in time; (2) that no undeserving man should be promoted and if not good enough for promotion he should be eliminated; (3) that the few of universally recognized and exceptional merit should get on faster than others. The regular statutory examining board for promotion ought to be so strengthened and helped (one method of doing this has been suggested above) as to be competent to accomplish (1) and (2) or else be abandoned. Selection can accomplish (3) if it be provided for on an entirely new system of determining merit.

Indirect Fire for Naval Guns

(SEE PAGE 61, WHOLE NO. 215)

COMMANDER D. C. BINGHAM, U. S. Navy.—The subject of "indirect fire" afloat is one of increasing and urgent importance and is deserving of the greatest consideration by those concerned with the progress in ordnance material, gunnery and tactics. The development in aircraft and in the use of smoke screens in naval warfare have made "indirect fire" feasible to an extent little understood except by those who have been vitally interested in such matters and responsible for improvement and progress.

The destruction of the *Koenigsberg*, the firing of the allied ships during the Dardenelles, the work of the Monitors of the Dover Patrol, and the low visibility conditions in the North Sea directed attention to this subject.

"Indirect fire" implies that observations or spots (the term used in the navy) will be from a forward position, that is, from a point outside of the ship. The kite balloon was originally adopted to this use but for many reasons it was and is not a satisfactory solution of the problem. Plans have been made for the use of outlying vessels; this scheme is far less satisfactory than the use of the kite balloon.

Aircraft similar to those used in land warfare are suitable in every way for making the forward observations as they can be landed from heavy ships just before going into action, or from specially constructed carriers to which they can return—the *ideal solution of the problem*.

It may be said without fear of successful contradiction that any naval force that goes into action in the future without every facility for "indirect fire" will be severely handicapped, if not entirely outclassed.

A gunnery officer in commenting on the visibility conditions as a result of his experiences in the Great War made the following remarks:

"I think the important points that have been driven into us in the last year or two are:

"The extreme difficulty of seeing. By this I mean to include anything in the way of a definite target outline, or fall of shot. . . ."

"That in a fleet action the visibility after the first few minutes will always be bad, not from the weather point of view but from the funnel and cordite smoke hanging over the whole fighting area."

Let us assume that one side in a fleet engagement has control of the air and installations aboard ship which permit of "indirect fire," whereas the other side has made no progress in such matters. Can anyone doubt the overwhelming victory that awaits the side that has been progressive?

But there is another all-important factor to be considered under this subject—the smoke screen, not necessarily the smoke screen made by destroyers with which all are familiar but screens made by smoke bombs, shells, boxes. Such bombs will be dropped accurately by aircraft, also carried by all kinds of surface and sub-surface craft to be thrown overboard at the proper time. Then "indirect fire" only will be possible and a navy must be ready for it in every respect.

In this connection, this article on "Indirect Fire for Naval Guns" recalls the account and discussion of "The Destruction of *Koenigsberg*" by Mr. Arthur H. Pollen in his book, "The British Navy in Battle," in which the author invites attention to the lack of "an intelligent system of communicating proved principles and the result of successful practice."

In view of the fact that our navy has no aircraft carriers and none authorized or building, the author's concluding remarks are so pertinent that they are quoted herewith:

"Nothing could better illustrate the curious individualism which governs the organization of our sea forces. Each ship, each squadron, each fleet seems to come to the study of these things as if they were virgin problems, entirely unaided by advice and information from the central authorities, so that there is not only no uniformity of practice—in itself a not unmitigated evil—but what is really serious, a total absence of *uniformity of knowledge*. I am the last person in the world to suggest that all naval affairs should be regulated in every petty detail from Whitehall. There are quite enough forces at work to repress freedom of thought or restrict liberty to investigate and experiment in the fullest possible way. But there is surely the widest possible difference between a restraining tyranny and an intelligent system of communicating proved principles and the results of successful practice.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 5490. New members, 527. Resignations, 133.

Membership Campaign A membership campaign is being conducted, both among officers of the regular service and of the Reserve Force. It is believed that *all officers* should support the Institute by joining. Publication costs are such that a large membership is imperative. The PROCEEDINGS are an excellent medium for keeping officers, and particularly those in an "inactive status," in touch with naval affairs.

The response to this campaign, to date, has been so gratifying that there is a probability of the January number becoming exhausted before all new members can be supplied. In this event, the remaining applicants will have their membership dated as of February 1.

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Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

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Notice Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 145, 146, 147, 149, 155, 167 and 173 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, Md., January 15, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO	I
PUBLICATIONS, U. S. NAVAL INSTITUTE	(2)
SPECIAL NOTICE	304
TOPICS FOR ESSAYS	305

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.	}	France	253
NAVAL POLICY.		Great Britain.....	255
MATÉRIEL.		Japan	262
PERSONNEL.		United States.....	263
MERCHANT MARINE.			
AERONAUTICS			272
ENGINEERING			273
ORDNANCE			280
MISCELLANEOUS			281
CURRENT NAVAL AND PROFESSIONAL PAPERS.....			287

FRANCE

SEAPLANE VERSUS BATTLESHIP.—The comprehensive bombing and firing seaplane experiments shortly to take place on the ex-Austrian 20,000-ton dreadnought *Prinz Eugen* are the object of a careful preparation both in Paris and Toulon, and are expected to elucidate important points of offence and defence that seem to have been overlooked in the course of the recent interesting American experiments in the antiquated *Indiana*. Minister Landry last week jokingly remarked: "*Quant à nous, sans renoncer aux mastodontes, nous préférons pour le présent laisser aux riches marines de l'Angleterre et des Etats-Unis le soin d'en rechercher, par des expériences coûteuses, les caractéristiques nouvelles.*" But the truth, to judge from the activity now being displayed and projected in the experimental line, is that the Rue Royale Admiralty realizes that to copy others is an injudicious policy involving both delay and inferiority, as it is naturally an invariable practice with all Admiralties to keep for themselves the exclusive benefit of the most valuable data collected in costly experiments. An unprecedented outlay is next year to be incurred in practical researches and experiments to be carried out both at sea and in newly-created or enlarged naval laboratories, in the execution of a "*programme de recherches et d'études scientifiques*" framed with the co-operation of the leaders of the French scientific world. From the successful effort France made in the war to catch up to Germany, that had, in 1914, achieved a tremendous advance in that line, it is possible to gauge what her future achievement will be, once narrow-minded *esprit de corps* and petty jealousy no longer stands in the way of a rational utilization of the country's intellectual assets. Moreover, the long experience of realistic investigation which the Gallic Navy possesses will stand her in good stead. The Jena tests proved the means of evolving the best armor-piercing shell, the "*obus alourdi*" of 450 and 600 kilos (3 per cent explosive charge, delayed fuse) which was copied by the German and later by the British Navy. The Duperré experiments showed the worthlessness of torpedo-shells (*obustorpilles Perruchon de 240 mil.*) against strong armor, whilst the successive Lorient experiments in the Mirabeau, Gascoyne, and on the Gâvres firing range demonstrated the value of "elastic cushions" and longitudinal bulkheads to minimize the effects of

submarine explosions, together with the superiority of the new type of armor (Homecourt-St. Chamond, chrome-nickel-elastic surface), without mentioning the turret and fire-blast tests in the *Henri IV*, and *Suffren*, and also the successful experiments carried out in the course of the war with a view to a better protection of powder magazines and of the vital parts of ships.

The avowed intention of the Minister of Marine is, so to speak, to permanently mobilize the scientific and industrial resources of the Republic for the benefit of the naval armament, and a start is to be made with a test of the vulnerability of armored ships to aerial attack, which will have a great influence in shaping the policy of to-morrow. If the *Prinz Eugen* is sunk by seaplanes, a series of conclusions most agreeable to the *Jeune Ecole* will be drawn, namely, that aerial flotillas, while being cheaper than torpedo or submarine flotillas, are in a position to victoriously assail battle squadrons both on the high sea and in harbor, and the battleship is doomed, having about as much chance as a "*lapin poursuivi par un aigle*," and consequently, that France can strike from the air at any likely enemy, defend her coasts, and control narrow seas, thus preserving at small cost a determining influence on European sea contests.

No wonder the utmost care is being taken to avoid faulty or incomplete conclusions being arrived at through hasty and insufficient preparation of the three component elements of the forthcoming test, viz., the target, the bombing machines, the projectiles.

The *Prinz Eugen*, while being well built (French experts consider Austrian construction to be excellent, and superior to that of the *Boche*), is over-gunned, top heavy, and not up to the French standard of battleship robustness, being especially inferior in deck protection and armoring generally, even to the *Mirabeau*. Modifications, some strengthening, and the fitting of anti-aerial overdeck screens are required, as what it is sought to learn is not the anti-aerial worth of the ships of yesterday, but the value of the very latest anti-aerial devices. If the target cannot be towed or be controlled electrically, as was the United States *Indiana*, the experiments will lose some of their interest.

As to the projectiles, the arsenal of flying machines has considerably increased since the war, mostly owing to bombing experiments conducted by the Ministry of War, that is working in cooperation with the Admiralty in the interests of aerial offence. The bombing test will commence with the projectiles of least caliber and destructive power, as it is intended to preserve the valuable target as long as possible, and to minutely ascertain the results of the successive hits and explosions, which means that the bombardment may last many days: (1) *Obus-fumigènes*, smoke-producing, intended to temporarily blind conning-tower and turret complements, and so for a little time put the ship *hors de combat*. (2) Asphyxiating shells, inflicting permanent disabilities on the personnel. (3) Incendiary bombs, combining also the effects of the first-named missiles. There are several types in service in the army, of which Commandant Ortlieb says: "*Les obus incendiaires ont été rarement employés avec succès* (L'Aéronautique—Masson, Editeur, Paris). (4) Small 10-kilo bombs, army type, to be dropped by the dozen with a view to the lucky shot into funnels or unarmored openings. (5) Heavy armor-piercing bombs, up to one ton, the direct hit of which no deck protection could resist. (6) Torpedoes or Michelin bombs, for direct or indirect hits, intended by their tremendous blast to cause internal explosions or other paralyzing damage. If the last-named projectiles are only half as powerful as claimed by their inventors, the *Prinz Eugen* will founder with the first blow.

But there will only be counted those projectiles that hit the target, and to judge from what occurred in the United States *Indiana*, bomb-dropping at a great height over a moving target (30 mètres by 160) is not a particularly accurate game, as was also shown by the bombing of the *Goeben*. Rightly or wrongly, however, French aviation "aces" are believed to excel

all comers in the matter of up-to-date aiming appliances and of training. With the Michelin "*viseur*," improved and experimented upon in the Aulnat camp, and especially with the bomb-dropping "*en trainée*," in clusters, every machine flying over the Austrian target ought to secure hits. The forthcoming tests will afford splendid training to the body of naval aviators whose spirit is being revived by the encouragements the present Minister is bestowing on aviation. Torpedo-launching by seaplanes offers the possibility of simultaneous concentration of several machines against one target, whereas even in group flying the only tactics are individual bomb-dropping. All these questions will receive attention.

So far so good; but the misfortune is that the coming tests, whatever efforts are made, will not give even an approximate idea of what will take place in war, when a battleship at sea will oppose to her aerial antagonists (1) her zig-zag course, (2) the bursting shells of her anti-aerial battery, (3) the watch and attacks of her escorting *avions de combat*, and (4) by night, the blinding flash of her searchlights, without speaking of the protecting screen of smoke which the ship could raise. It must be added that to carry heavy projectiles, and be really dangerous to battleships, hydravions must attain a high carrying power, at least two tons, which means a span of over 40 mètres; that is heavy, relatively slow and vulnerable machines. Armored *avions* will never have plates thick enough to resist medium-size naval guns.

Therefore, before an unthinking popular craze sets in, it is well to remember that the question has two sides, that the outlook for anti-aerial defence is, on the whole, bright, and, lastly, that wisely-managed navies build for to-morrow, and not merely for to-day, taking into consideration the fact that any new danger is sure to-morrow to meet its antidote. Moreover, aerial command of the air is somewhat negative; it would not do to forbid others using the sea and to lose yourself the vital benefit of safe sea communications, and so armored ships will ever be necessary to enforce their right to sail against both aerial and submarine ambushes and to attend to the needs of maritime transportation.

The importance of safe maritime communications and of an adequate fleet to guard them is no longer denied in military circles, and army experts are unanimous in advocating a strong "programme naval." Significant reference to this subject is notably to be found in the "*Leçons de la Guerre, par le Commandant Bouvard* (Masson, publishers)," which call attention to the much-increased rôle of the sea in the contests of to-morrow, and to the vanity of military preparation that is not based on the command of the sea, on the faculty of receiving oversea reinforcements and supplies. "*La maîtrise des mers est une nécessité primordiale. Il n'y aura plus de guerre purement continentale*." (Page 20.) The author, it is worth noting, foresees the triumph of the submarine, in keeping with the evolution in land warfare: "*car la guerre fuira la surface des eaux comme elle fuit la surface du Sol*."—*The Naval and Military Record*, Dec. 15, 1920.

GREAT BRITAIN

A SCHEME OF EMPIRE NAVAL DEFENCE.—It is not long since we drew attention to the serious decline that is taking place in the relative strength of the British Navy owing to the higher standard of tactical efficiency which has been adopted for capital ships since the war. We pointed out that progressive naval opinion was not prepared to rate as first class any ship of this type which mounted guns of less than 15-inch caliber. Additional point has now been given to our observations by the statement of a London paper that the Admiralty would be ready to dispose of all our present battle-cruisers, excepting only the *Hood*, if purchases could be found for them. Such vessels as the *Lion*, *Princess Royal*, and even the *Tiger* are now regarded as obsolete in the battle-cruiser category, on the ground of inadequate armament and speed. If this statement really repre-

sents the views of the Admiralty, the future status of the British Navy will be considerably lower than is commonly realized. We are not by any means well supplied with ships that come up to the latest standard of fighting power. There are only 10 British battleships with a 15-inch armament, and only 3 battle-cruisers which combine 15-inch guns with a speed of 30 knots or over. No new ships are under construction, nor does there seem much likelihood of any large armored ships being ordered within the next year or so. On the other hand, large programs are in course of execution in America and Japan, both of which powers are reconstructing their battle fleets on the basis of maximum efficiency as regards the individual power of the ships.

The Admiralty are aware, of course, of what is taking place abroad, and would certainly recommend the resumption of shipbuilding here if they considered our position to be as unsatisfactory as the above figures indicate. The fact that they have not yet done so is significant. The constitution of the present board is a guarantee that the vital interests of the navy will not be sacrificed to political expediency. If Lord Beatty and his colleagues believed that new battleships were urgently needed they would not hesitate to approach the government in this sense, or to take strong action if their advice were disregarded. Our own view is that both the Admiralty and the Cabinet are in agreement as to the desirability of waiting upon events a little longer before drafting any hard and fast scheme of naval policy. As Mr. Lloyd George announced in Parliament a fortnight ago, it has been arranged that the Dominion Premiers shall come to London next June to confer with the Imperial Government. At this meeting the whole question of naval defence will be exhaustively discussed, and hopes are entertained that decisions satisfactory to all parties will be reached on every essential point. The destruction of the German Fleet and the absence of any new challenge to our sea supremacy in Europe are factors that enable the home authorities to take a broader view of Imperial defence than was possible when the German menace seemed to fill the whole strategical horizon. It is certain, therefore, that any suggestions from Australia, New Zealand, and Canada touching a more adequate representation of British naval power in the Pacific will receive a sympathetic hearing from the Admiralty.

Although the reports submitted by Lord Jellicoe in 1919-20 have not yet been published in full, they are known to embody very large proposals in this direction. In his judgment the security of our Imperial communications will demand in the next five years the formation of a powerful fleet for service in Far Eastern waters. This fleet, he considers, should be made up of units from the Royal Navy, the East Indies Squadron, and the Navies of Australia, Canada, and New Zealand. It should consist of at least 8 battleships, 8 battle-cruisers, 10 light cruisers, 40 destroyers, and 36 submarines, all of modern type. The cost of maintaining this fleet is estimated at £19,750,000, of which sum Australia would contribute £4,000,000, eventually rising to £6,000,000, and New Zealand's share would be £375,000, rising within five years to £4,000,000. The amount of Canada's contribution is apparently left open. The dimensions of this new fleet may seem startling at first sight, but a moment's reflection will show that it would be no stronger relatively than the force that we used to maintain at Malta when the Mediterranean Sea was our chief frontier. It is an elementary principle of strategy to concentrate strength at the most sensitive point. This principle has always guided our naval dispositions up to now, and it would be the height of folly to ignore it in future simply because its observance would mean keeping the bulk of our naval force on the other side of the globe. If the creation of such a Far Eastern fleet is considered to be the chief task of the future its accomplishment should be well within the combined resources of the empire. We already possess many of the ships specified, but it would be necessary to build more battle-cruisers to bring the fleet up to its full strength in this type. As for home defence, this duty might safely be entrusted to our older ships, armed with 13.5-inch guns,

which, although not up to the ultra-modern standard of fighting power, are certainly superior to the capital ships of other European Navies. A solution of the Empire naval problem along the lines we have sketched would appear to fulfil every requirement, and granted a fair and equitable apportionment of the common burden, its cost need not impose an intolerable strain either on the mother country or the Dominions.—*The Naval and Military Record*, Nov. 24, 1920.

ECONOMY AND SECURITY.—It is now becoming clear to the public that a survey of the naval horizon at the present time shows three courses to be open to us as a nation and empire more dependent than any other in the world on sea power. The first is to maintain our present position of supremacy at all costs. The second is to consent to a state of equality with the next strongest naval power. The third is to do nothing and thereby drop to the second, possibly even the third, place among the maritime nations. There is apparent a tendency in certain quarters to confuse the issue by an appeal to controversy as to whether the battleship has not been displaced, as the primary unit of naval strength, by some other type. This, however, has really nothing to do with the broad question of national policy on which the government must make a decision. Battleships or submarines are merely the terms in which naval power is expressed, and the Admiralty must be the best possible judges as to which of the two classes are the more essential, or in what proportions they shall be provided in the future fleet. The standard of strength is laid down by the Cabinet, but the board see to its maintenance.

It would seem that the government, from certain hints given by Mr. Lloyd George in recent speeches, particularly that at the dinner last week of the Federation of British Industries, incline to the third course outlined above, animated solely by a desire for national economy. The Premier is reported to have said that "You must take into account not the merits of any particular proposal for expenditure, but the national resources for the time being, when the burdens on the community are gigantic, and when things, which may be all right three years hence, at the present moment are unwise and beyond our means." It is not certain, of course, that the Prime Minister would regard a proposal to resume warship construction in this light, but at least there must be some of his followers, and many of his critics, who would do so. The need of the moment is for information and guidance on the present naval situation, so that an enlightened public opinion may be ready to judge any measure which the Admiralty may find it necessary to recommend to the country. Do the people know that no battleship has been laid down in England for nearly seven years—since the keel of the *Royal Sovereign* was laid on January 15, 1914; but that since April 24, 1917, America has laid down 10 such vessels and Japan 4? Also that America has 6 battle cruisers of post-war design, and Japan 4, building or authorized, to our one *Hood*, of what may be called semi-post-war design? Here is a chance for the Navy League to fulfil its primary purpose by placing the facts and figures before the country.

Of the urgency of economy there can be no question. It has been insisted upon frequently in this journal during the past two years, if only because we should need money later to maintain our naval position. If it should come about that even the desire to save money has to be sacrificed to build ships, it will be because the navy is our main insurance, essential to our well-being and prosperity. The Admiralty have done their part, for as Admiral Sir Dudley De Chair said at the Guildhall last month, they give place to none in not only practising the greatest economy, but in setting the example in so doing. This, indeed, has been the remarkable contrast. The navy, the bulwark of our security and the mainstay of our overseas trade, has been cut down to the bone, while money has been squandered on schemes of new Ministries. A Bill for an *extra* nine and a half millions has just been presented to Parliament by the Ministry of Labor, the new Mines Department, and others, and moribund

Ministries—such as those for shipping, munitions and food, which should have been wound up months ago—continue to pour out public money. No work upon which these offices are engaged can be relatively as important to the welfare of the Empire as the maintenance of an adequate, efficient, and ready fleet.—*The Army and Navy Gazette*, Dec. 11, 1920.

ROYAL AIR FORCE.—A brief summary of Royal Air Force organization, policy and estimates, as formulated for the current financial year.

The permanent organization of the Royal Air Force was outlined in a memorandum prepared by the Chief of the Air Staff, and presented to Parliament, with a note by the Secretary of State, in December, 1919 (Cmd. 467).

In planning the organization of the Royal Air Force, it was assumed that in the immediate future nothing in the nature of a general mobilization need be contemplated, that efforts should be concentrated on providing for present needs, and on founding a highly trained and efficient force, capable, without drastic alteration, of expansion should the necessity arise in years to come. The principle has accordingly been to limit the number of service squadrons to the number considered essential to meet our present responsibilities, to devote the remaining resources to perfecting the training of officers and men and to constructing a sound framework on which to build the Royal Air Force of the future.

The principle to be kept in mind in forming the framework is that in the future the main portion of the Royal Air Force will consist of an Independent Force together with the personnel required to carry out aeronautical research. In addition, there will be a small part of it specially trained for work with the navy, and a small part specially trained for work with the army. It is possible that the main portion, the Independent Air Force, will grow larger and larger, and become more and more the predominating factor in all types of warfare.

The present policy is to create an air force spirit, or rather to foster this spirit, which undoubtedly existed in a high degree during the war; to eliminate accidents, which necessitates the thorough training of mechanics in the numerous trades required, and consequently the enlisting of skilled ranks as boys and training them in the service; to train officers in technical subjects, such as navigation, meteorology, photography, wireless, etc., experts being essential for the development of the science of aeronautics, which is still in its infancy.

The training for officers and men is briefly as follows: In the case of officers, owing to the necessity for a large number of officers in the junior ranks and to the comparative paucity of higher appointments, it is not possible to offer a career to all. Consequently, some 50 per cent only of the officers are permanently commissioned in the Royal Air Force, the remainder being obtained by granting short service commissions and by seconding officers from the army and navy. Great importance attaches to the last class, since an interchange of officers is bound to make for closer and more intelligent co-operation between the services.

The channels of entry for permanently commissioned officers are through the Cadet College at Cranwell, from the universities and from the ranks. The Cadet College is the main channel. The course lasts two years, during which the cadets are given a thorough grounding in the theoretical and practical sides of their profession and learn to fly the approved training machine.

On leaving the College cadets are commissioned and posted to a squadron. Apart from courses that every officer will normally pass through, such as gunnery and air pilotage, officers will be required, after five years' service, to select the particular technical subject they will make their special study during their subsequent career, *e.g.*, navigation, wireless, engines.

The career of an officer commissioned from the universities or from the ranks will be identical with that of those from the Cadet College, except

that he will be taught to fly at a training wing before joining his squadron. Short service and seconded officers will be taught to fly at training wings and will attend a course of aerial gunnery, and probably one of air pilotage.

With regard to men, which constitutes the most difficult problem of all, it has been decided to enlist the bulk of those belonging to long apprenticeship trades as boys, who will undergo a course of three years' training before being passed into the ranks. The boys, on successfully passing their final examination, will be graded as leading aircraftsmen and a certain number will be specially selected for a further course of training, at the end of which they will either be granted commissions or promoted to corporal. Those granted commissions will join the Cadet College.

The remainder of the mechanics, of whom more than half will belong to short apprenticeship trades, are being enlisted as men and receive twelve months' training before being posted to units.

Non-technical men are given a short course of recruit training at the Royal Air Force Depot at Uxbridge.

The Royal Air Force estimates for 1920-21 provide for an establishment of 29,730 officers, warrant officers, non-commissioned officers, airmen and boys (exclusive of those serving in India).

The net estimate for effective services includes:

	£
Pay, etc.	4,661,000
Quartering, stores (except technical), supplies and transport...	2,005,000
Technical and warlike stores.....	6,172,850
Works, buildings and lands	3,647,000
Air Ministry	877,000
Experimental and research services	2,575,540

The following units and establishments are provided for in the above estimates:

UNITED KINGDOM

Striking Force	2 Squadrons.
Training Wings	2 of 3 Squadrons each.
Co-operation with Army Divisions...	1 Squadron.
Co-operation with the Fleet (Home waters).	1 Squadron Reconnaissance and Artillery machines.
	1 Flight Ships Fighters.
	$\frac{1}{2}$ Squadron Torpedo Machines.
	1 Flight Flying Boat.
	1 Flight Float Seaplanes.
Communication duties	1 Squadron.
Experimental Stations	4 Stations for Aeroplanes, Seaplanes, Torpedo Machines and Wireless respectively.
Schools and Training Centers	Cadet College.
	Navigation School.
	Flying Instructors' School.
	Administrative and Technical School for Officers.
	Wireless and Electrical Training School.
	School of Photography.
	School of co-operation with navy.
	School of co-operation with army.
	Balloon Training.
	Airship Training.
	Boys' Training Center.
	Technical Men's Training Center.
	R. A. F. Depot and Non-technical Men's Training Center.

Depots	2	Aeroplane Repair Depots.
	1	M. T. Repair Depot.
	3	Stores Depots.
Airships	1	Station.

OVERSEAS

India	8	Squadrons.
	1	Depot.
Egypt	7	Squadrons.
	1	Depot.
Mesopotamia	3	Squadrons.
Malta	1	Flight Seaplanes.
Alexandria	1	Flight Float Seaplanes on carrier.

HIGHER ORGANIZATION

In the United Kingdom all units working with the navy are included under one command, known as the "Coastal Area."

The Coastal Area comprises two "Groups." No. 29 Group at North Queensferry, and No. 10 Group at Lee-on-Solent.

The other Royal Air Force Command is known as the "Inland Area," comprising No. 1 Group, with headquarters at Kenley, which includes Royal Air Force units in the area that corresponds to the Eastern Army Command; No. 7 Group (Andover), corresponding to the Southern Army Command; and No. 3 Group (Spittlegate), corresponding to the Northern and Western Army Commands.

Directly under the Air Ministry are the 11th (Irish) Wing, the Airship Base at Howden, No. 1 School of Technical Training (Boys), at Halton, and Cranwell Cadet College.

Overseas are:

- (i) The Middle East Area, comprising the Egyptian Group, the Palestine Group and the 31st (Mesopotamia) Wing.
- (ii) The Mediterranean Group (Headquarters, Malta), comprising all units (for co-operation with the navy in the Mediterranean).
- (iii) The Indian Group.

RECENT EVENTS

On August 1, No. 55 Squadron, which, with its repair unit, had arrived at Constantinople from Suez on July 13, was ready for the field. By the time the squadron was ready an alteration in the situation averted the need for active offensive action and machines were consequently chiefly employed on photographic work.

On August 25, owing to the spread of disturbances in Mesopotamia, it was decided to transfer this unit to that country. The Admiralty were able to make H. M. S. *Ark Royal* available for this move. With the special accommodation provided on the *Ark Royal* it was only necessary to remove the wings from the machines to enable them to be loaded. H. M. S. *Ark Royal* sailed from Constantinople on September 4 and reached Basra on September 23. The disembarkation was completed by September 25, and a week later all machines were serviceable and eight had already arrived at Bagdad by air.

This move very clearly demonstrated the immense value of the aircraft carrier for the rapid transport by sea of Royal Air Force units. Had it been necessary to employ an ordinary ship in this instance, machines would have had to be completely dismantled and packed in cases, and great delay would have resulted both at Constantinople and Basra.

No. 84 Squadron has been reformed in Mesopotamia and is equipped with D. H. 9A's.

In common with the army the Royal Air Force has had to respond to many calls as a result of the rising in Mesopotamia. Machines have been

actively co-operating with relief and punitive columns and many reconnaissances have been necessitated. A considerable amount of independent bombing has been carried out and satisfactory results have been obtained.

Medical comforts and other necessities were dropped on the beleaguered garrisons at Kufa and Samawah, including, at the latter place, a replacement for a damaged component of the post's wireless set.

Communication with Kufa was maintained by aeroplanes, by means of a Popham panel, which had to be dropped in the first instance.

During September a torpedo attack trial by ten torpedo-carrying aeroplanes against H. M. S. *Queen Elizabeth* was carried out. Most interesting results were obtained.

A Dutch Naval and Military Commission has arrived in this country to study the organization of the Royal Air Force.

Four non-rigid airships, spares and equipment have been handed over to the Dominion of Newfoundland as a free gift.

Sanction has been given for the appointment of Air Attachés at Paris, Washington, Tokio and Berlin.

Arrangements have been made to send ten officers into residence at different colleges at Cambridge to take a special course in engineering.

Proposals have been put forward to the institution of Mechanical Engineers, the Institution of Electrical Engineers and the Institution of Civil Engineers, that officers granted short service commissions in the Royal Air Force, who subsequently take up the engineering profession, shall be allowed to count their service in the Force as the equivalent of the time which they are normally required to spend in workshops before they can become eligible for membership of an engineering institution.

The Ministry of Labor has invited the Air Ministry to confer with them on the question of securing recognition by the principal trade unions of the Boy Mechanics' Training Course as equivalent to periods of apprenticeship, in order to secure their acceptance by trade unions as skilled men on the termination of the period of active service. The importance of the question lies in the fact that a satisfactory agreement with the trade unions will probably affect largely both the numbers and the quality of the candidates for entry as boy mechanics.

Volunteers have been asked for from the navy and army for seconding to the Royal Air Force, for a period of four years. Nine officers have been so seconded from each service.

The formation of five additional reserve squadrons has been approved. Two of these will be formed in Egypt and numbered 8 and 45 respectively, the formation of the former being taken in hand at once to replace No. 55 Squadron, transferred from Egypt to Mesopotamia. No. 8 Squadron will be equipped with D. H. 9A machines.—*The Journal of the Royal United Service Institution*, November, 1920.

BRITISH SHIPYARDS ARE FACING PERIOD OF DEPRESSION.—London, Nov. 20.—During the past twelve months there has been remarkable activity in British shipyards notwithstanding the high price of materials and repeated labor trouble; but the outlook for the immediate future is not bright, as when the vessels which have been under construction this year have been completed, there is not much new work to take their place.

It is extremely doubtful whether during the next twelve months another 2,000,000 gross tons of shipping will be put in hand. The rate of construction has fallen off since the war both to reduced hours and reduced output per man; it is doubtful whether the old rate can be regained. Practically the whole of the vessels under construction last summer—780 ships with a gross tonnage of 2,520,000 tons—have now been added to the British merchant marine, which is now approximately equal to what it was before the war. Owing to a variety of causes it is not now as efficient as it was, due to congestion and loss of time in harbor, defective railway facilities, labor difficulties and so on; consequently the effective work which can be got out of a vessel has been reduced fully 25 per cent.

U. S. Restored Balance.—Expressed differently, 20,000,000 gross tons of shipping are now only equal to 16,000,000 of pre-war times. That should render the total tonnage of the world, nearly 54,000,000 gross tons, insufficient for the world's trading requirements; but the United States has restored the balance by the remarkable feat of increasing her seagoing fleet by more than 10,000,000 gross tons.

The cost of shipbuilding now exceeds \$144 a deadweight ton, not far below the American lead. Normal construction is now general, both in Great Britain and other European countries, and the building of so-called standard ships has ceased; it was a passing practice of doubtful value here and even during another war it is doubtful whether it would be revived on this side.

The value of standard ships is much below that of vessels built to owners' special requirements. Most shipping companies will be prepared to pay higher prices for specialized ships. A number of trading steamers which have been completed and are rapidly approaching completion, which have a higher speed than was generally considered to be truly economical before the war. The 10 to 11 knots of pre-war cargo vessels is now being increased to 12 and 13 knots, that may tend to neutralize loss of time in harbor.

Economy of Oil Fuel.—Probably most of the more recently ordered trading steamers will use oil fuel, as the enormous rise in the price of coal since the war renders its use unprofitable; alternately they are being provided with internal-combustion engines of the Diesel type. Coal-fired steamers are subject to frequent delays owing to difficulties of obtaining fuel.

Assuming the price of oil to be 50 per cent greater than that of coal, or even double the price of coal, say \$28.80 against \$19.20, as a steamer provided with oil-fired boilers only requires approximately 50 per cent of the weight of fuel, as compared with the requirements of a steamer using coal, it is obvious that a desirable economy is possible, in addition to which the labor bill is much reduced.

In a motor ship the weight of oil required is barely one-fourth that of coal used in a steamer of corresponding size and speed. It only requires an assurance that oil could be obtained everywhere, for coal-fired steamers to become obsolete within a few years. Motor vessels of large tonnage are now being constructed in Great Britain; they are in fact becoming extremely popular with shipping companies. Thirteen thousand tons and a speed of 13 knots will soon be left behind. Each vessel of this tonnage has two oil engines, each of 3300 horsepower with eight cylinders.

Motorships in Italy.—Due no doubt to Italy being without coal deposits, motor shipbuilding is being rapidly developed there. Quite a large fleet of Diesel-engined vessels has been constructed since peace was declared; from 50 to 60 steamers varying from 6000 tons deadweight to 11,000 tons. Both two-cycle and four-cycle motors have been installed, with four cylinders of 1150 horsepower each, driving twin screws, yielding a speed of about 11 knots and consuming 11 tons of fuel for each 24 hours. In these F. I. A. T. installations the main air compressors are driven direct from the crankshaft.

Shipping companies in England have without an exception greatly increased their profits compared with 1913.—*The Nautical Gazette*, Dec. 11, 1920.

JAPAN

JAPANESE PRESS CRITICISM OF JAPAN'S BUILDING PROGRAM.—It now cost over Y70,000,000 to build a battleship, and if the present tendency toward bigger ships and bigger guns continues, time will not be distant when the cost of a battleship will amount to Y80,000,000. Japan is short of funds, and she should devote her efforts toward the construction of the so-called economical navy.

If the 8-and-8 fleet is to be always maintained, it will require over Y250,000,000 every year, and when various accessory expenses are taken

into account, the armament expenditures will amount to a great figure. Moreover, experts say that even the 8-and-8 fleet is not sufficient to meet the requirements of the country, and they urge that another extra fighting unit should be provided. If the naval armaments of the country are to be completed and maintained perfect, over 30 per cent of the total expenditure of the state will have to be annually devoted to this object, a proposition which it is difficult for the country to bear in the present state of its financial position. It is, therefore necessary that the authorities should strike a new line in naval policy and maintain an economical navy. The most important thing in this connection is the reform of battleships which constitute the main force of the navy.

In our opinion the main units of the fleet should not be divided into battleships and battle-cruisers. In order to construct an economical navy, the differentiation should be effaced in favor of battleships of high speed. At present there is a difference of about six knots between the speed of battleships and that of battle-cruisers. The smaller the difference the better.—*Jiji*, Nov. 26, 1920.

UNITED STATES

ANGLO-SAXON UNION TO BAR JAPANESE IMMIGRATION.—The cry for a white Australia has been followed so continuously by similar cries in Canada and the United States that a possible working agreement between the United States, Canada, Australia, New Zealand, and South Africa is now being bruited for the purpose of maintaining a united front against Japanese immigration. This question is described as a club in the hands of the British Dominions which they intend to have ready at the Imperial Conference next spring when the subject of the Anglo-Japanese Alliance will be discussed. Meanwhile, how is Japan to find vent for her surplus population, now increasing at the rate of three-quarters of a million a year, asks a Tokyo correspondent of the London *Morning Post*, who says that this is one of the most difficult problems confronting Japan's statesmen, and may in some measure explain the nation's expansive policy. There are now more than 350 Japanese to the square mile, and as most of the sparsely settled lands of the world are under British or American rule, this informant points out, Japan naturally looks toward England to help her out of the dilemma. Because England "hesitates to offer any solution to the problem and at the same time bars the door against the Japanese, while admitting Germans and others, Japan cannot understand her avowals of friendship." We read:

"She holds that race prejudice must be hopelessly ingrained when it refuses to find relief for labor troubles by welcoming the more efficient and strenuous toilers of the Far East. Japan regards the immigration problem as something more than a question for her or for any one nation, as a matter that should concern humanity. It may be that she will find some measure of relief in the new fields being opened up in Manchuria, Siberia, and Saghalien; but the Japanese are not naturally a northern people; they do not like a climate of low temperature, and so are not likely to migrate in any considerable number northward unless there is abnormal profit in it, and even then but temporarily. After the forests and mines are fully exploited it is improbable that the Japanese will care to remain. Moreover, in the view of Japan, this policy would but retard for centuries longer the evolutionary process that must needs bring East and West together if humanity is to attain ultimate unity and its highest development. The longer that blending of the higher races is delayed the greater will be the clash, she holds, when they are forced to meet by sheer congestion. A harmonious intermingling of East and West by gradual immigration would insure a more humane result."

In the Japanese press attention is largely directed to Japan's relations with the United States as affected by the anti-Japanese legislation in California. The Tokyo *Yomiuri* warns Americans that to exclude the Japanese

from California would be disastrous economically, for—

"As we have said, the Japanese plow desolate land and convert it into fine fields. What would be the result if all the Japanese withdrew from California? Land measuring hundreds of thousands of acres would revert to the former state of ruin. It would become impossible for California, which is famous for its fruit, to export so many apples, oranges, or grapes. The cultivation of rice in northern California would, of course, be suspended. Thus railways and ships trading with California would suffer from the falling off in freight, and there is little doubt that the prosperity of the famous port of San Francisco would be impaired. When the situation is thus considered, the anti-Japanese agitation of California is by no means an economic issue, as Americans say, but a very uneconomical question. If American laborers think that if Japanese are excluded from California, their own wages will rise and that their conditions of living will improve, they are egregiously mistaken. The development of California is prompted and promoted by Japanese immigration, and the Japanese immigrants obtain much benefit in that state. Exclusion is disadvantageous to both sides."

As to assimilation between races, the Tokyo *Chuwo* remarks:

"There are over 10,000,000 negroes in America. The Americans and the negroes represent two extremes, and no two things can be more different from each other than those two peoples. Yet the negroes form part of the organism of America, and their admission is due to the magnanimity of the Americans. Since the Americans and the negroes can work together, it may be said that no people cannot get together with the Americans. When 1,500,000 Jews made their way from Russia to America, it startled the world, but the immigrants were soon assimilated.

"The Japanese immigrants in America number only 70,000 or 80,000. Their presence ought not to cause any trouble, especially because they are earnestly working in the interest of America. Some Americans say that the Japanese are not assimilable, but this plea is wrong. No people are more assimilable to America than the Japanese, and, indeed, the complaint is frequently made in this country that they are too much like Americans. If there is anything in the attitude of the Japanese immigrants which makes the Americans think that it is difficult to assimilate them, it is due to the anti-Japanese agitation. The best means of facilitating the assimilation of the Japanese is to abandon the agitation. The fact that in spite of the frequent anti-Japanese agitations the Japanese immigrants have never resorted to any intrigues is the best testimony to their character."

Even if the principle of equality, for which Japan fought at the Peace Conference, were acknowledged by the League of Nations, says the Tokyo *Nichi-nichi*, it would be "meaningless" if the Powers did not abolish discrimination, but—

"It is a great mistake to think that if the principle of equality is recognized, the Powers will be placed under obligation to eliminate all discrimination against Japanese. The various nations have different traditions and stand in different position; it is absolutely within their right to impose restrictions on the peoples of other countries. From this point of view, we should be magnanimous enough to appreciate the fact that America is compelled to restrict Japanese immigration for internal reasons. As the resolution passed by the World's Sunday-school Convention declares, race inequality is contrary to the interests of mankind and deleterious to the peace of the world. Even if Japan had not introduced the race-equality proposal to the Paris Conference, she should take the present opportunity to espouse the principle. The Japanese are more than ever conscious of the necessity of abolishing all racial inequalities; their object is not to gain any political benefits but to get rid of spiritual insults."

In Australia the Melbourne *Herald* contends that there are valid objections to intermixture between races of widely different quality and traditions, even when they are capable of a considerable degree of assimilation. It has no wish to antagonize or to be unjust to an admittedly great people,

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,
AS REPORTED DECEMBER 31, 1920

Type, number and name		Contractor	Per cent of completion			
			Jan. 1, 1921		Dec. 1, 1920	
			Total	On ship	Total	On ship
<i>Battleships</i>						
44	California.....	Mare Island Navy Yard.....	95.2	94.2	94.8	93.7
45	Colorado.....	New York S. B. Cpn.....	64.8	60.2	63.2	58.3
46	Maryland.....	Newport News S. B. & D. D. Co.	90.	89.1	86.5	85.5
47	Washington.....	New York S. B. Cpn.....	55.4	47.3	54.1	45.3
48	West Virginia.....	Newport News S. B. & D. D. Co.	41.2	29.2	37.7	25.2
49	South Dakota.....	New York Navy Yard.....	19.8	12.	17.6	9.8
50	Indiana.....	New York Navy Yard.....	14.9	7.1	13.8	6.
51	Montana.....	Mare Island Navy Yard.....	15.9	8.3	15.1	7.3
52	North Carolina.....	Norfolk Navy Yard.....	19.8	12.1	18.6	11.3
53	Iowa.....	Newport News S. B. & D. D. Co.	11.9	8.6	10.9	7.6
54	Massachusetts.....	Beth. S. B. Cpn. (Fore River)...	.7	....	.5	....
<i>Battle Cruisers</i>						
1	Lexington.....	Beth. S. B. Cpn. (Fore River)...	5.1	.5	3.5	.4
2	Constellation.....	Newport News S. B. & D. D. Co.	3.6	2.1	2.6	1.1
3	Saratoga.....	New York S. B. Cpn.....	11.3	5.6	8.	4.4
4	Ranger.....	Newport News S. B. & D. D. Co.	.9	.3	.9	.3
5	Constitution.....	Phila. Navy Yard.....	1.8	.6	1.4	.5
6	United States.....	Phila. Navy Yard.....	1.8	.6	1.4	.5
<i>Scout Cruisers</i>						
4	Omaha.....	Todd D. D. & Const. Cpn.....	84.4	77.5	81.5	73.9
5	Milwaukee.....	Todd D. D. & Const. Cpn.....	74.4	70.9	71.1	67.7
6	Cincinnati.....	Todd D. D. & Const. Cpn.....	54.4	44.	50.2	35.8
7	Raleigh.....	Beth. S. B. Cpn. (Fore River)...	35.6	20.7	30.2	16.4
8	Detroit.....	Beth. S. B. Cpn. (Fore River)...	34.7	19.8	28.8	15.
9	Richmond.....	Wm. Cramp & Sons Co.....	58.	....	56.	....
10	Concord.....	Wm. Cramp & Sons Co.....	57.	....	55.	....
11	Trenton.....	Wm. Cramp & Sons Co.....	38.	....	34.	....
12	Marblehead.....	Wm. Cramp & Sons Co.....	36.	....	33.	....
13	Memphis.....	Wm. Cramp & Sons Co.....	28.	....	26.	....
<i>Miscellaneous</i>						
	Fuel Ship No. 18, Pecos.....	Boston Navy Yard.....	51.5	49.	47.	44.
	Gunboat No. 22, Tulsa.....	Charleston Navy Yard.....	43.8	32.1	41.8	28.1
	Hospital Ship No. 1, Relief.....	Phila. Navy Yard..... Comm.	12-28-	20	99.4	99.2
	Amm. Ship No. 2, Nitro.....	Puget Sound Navy Yard.....	99.7	98.8	99.6	98.5
	Rep. Ship No. 1, Medusa.....	Puget Sound Navy Yard.....	49.3	35.8	45.8	35.6
	Destroyer Tender No. 3, Dobbin.	Phila. Navy Yard.....	45.4	45.	41.4	41.
	Dest. Tender No. 4, Whitney...	Boston Navy Yard.....	7.5	3.	6.5	2.5
	Sub. Tender No. 3, Holland....	Puget Sound Navy Yard.....	7.1	....	8.6	....
	Aircraft Tender, Wright.....	Tietjen & Lang.....	25.	....	13.	....

In addition to the above there are under various stages of construction 31 destroyers, 45 submarines and 1 seagoing tug.

There were delivered to the Navy Department during December, 1920, 8 destroyers, 2 submarines, 1 seagoing tug and 1 hospital ship.

Authorized but not under construction or contract 1 transport, 12 destroyers and 7 submarines.

but "cannot escape the fact that Japanese settlement means the planting of Japanese outposts." Japan is a country of the "most determined and undying nationalists," according to this Melbourne daily, which continues:

"Her people take their country with them wherever they go. Is it reasonable to expect any nation to admit without restriction the settlers of a race which establishes colonies incapable of assimilation into the general life of the community? It is quite possible that such colonies would ultimately be dotted all over the United States. Their members would remain the nationals of a country known to be exceedingly ambitious, with an ever-advancing military and naval equipment, and most evidently bent upon commercial and imperial expansion. Another fact of great significance is that Japan is the only autocracy left in the world. Her Parliamentary system is not at all democratic, and the persons who control her destinies are the 'Elder Statesmen,' a very close corporation of nobles. Recent Japanese labor troubles have shown that industrial conditions are as bad as they were more than a century ago in Western countries. Labor has not yet gained the real right of organization. Every effort is made to check the growth of trade-unionism. Japan's existing rights in Korea and Manchuria give abundant room for the expansion of her population. Her claims in China, a country already over-populated, and with its own sovereign rights and high civilization, are open to question. American opinion has naturally been made suspicious by Japanese claims in so many spheres. Sources of fiction between Japan and the Anglo-Saxon nations are likely to remain until she becomes a democracy, capable of co-operating with other democratic nations in the peaceful settlement of international problems."

The Brisbane *Courier* says that one of the really great needs in Australia and in America is enlightened public opinion regarding the foreign policy of Japan. The dominating feature of Japan's foreign policy, we are told, is a "protectorate over China and a kind of Monroe Doctrine over the Northern Pacific." For the time Britain has been admitted to that sphere, "by reason of the Alliance, and doubtless a renewal of the Alliance is regarded by shrewd Japanese statesmen as a means of keeping Britain quiet." Russia no longer need be considered, we are told, Germany has been expelled from the Pacific, and France has no serious interests, but—

"America remains as the great barrier to Japanese ambitions, especially as America is forcing her interests in China and maintaining that the 'open door' in China shall be open to all. America, too, has frustrated Japanese ambitions to some extent in Shantung. That is the whole secret of the growing Japanese animosity to America, and whether we like it or not we are much concerned in the outcome."

The sharp division of opinion on the Japanese immigration problem that exists in Canada may be disclosed by the comparison of two editorial expressions. For instance, the Vancouver *Daily World* says:

"On the Pacific seaboard the natural increase of oriental races already in the country is as alarming as the influx of their yellow brethren from overseas. Every thirteenth child born in California is a Japanese, while more than 16,000 came into the United States last year in spite of the gentleman's agreement between the two countries concerned."

"These are great problems for our southern neighbors. For Canada the problem is greater still, increasing inversely to the size of the country's population. We now have as many as we can assimilate in our Northwest. We have as high a proportion of Asiatics to our own population on this coast as is safe."

On the other hand, the London (Ontario) *Free Press* warns against misstatements about the Japanese, and observes:

"The current objection to the Japanese is that they work for less wages and for longer hours, than Canadians think proper, and by so doing tend to reduce the standard awards of labor. These objections have held in the past. For the future they are offset by Great Britain's answer to the delegates' plea for racial equality. Other objections have been raised to the Japanese views of marriage, but they are ill-founded. The Japanese

marriage is a civil contract, and when the names of the contracting parties are duly registered they are as well married as are citizens of Canada who have gone before a magistrate or signed their contracts before church authorities. Trouble does not arise from this quarter—but there is danger from the Japanese attitude on divorce. Among the Japanese divorce is unnecessarily frequent and granted for trivial reasons. This ill-advised practice could be offset by clauses in the immigration laws to the effect that Japanese becoming residents of Canada must live by Canada's laws in all respects."

Canada's one line of procedure in the judgment of this journal is "to have the Japanese question thoroughly investigated, to make well-founded opinions and then see that these opinions have a chance to become operative."—*The Literary Digest*, Jan. 8, 1921.

"UNJUSTIFIABLE HOMICIDES" IN HAITI.—There are at least three ways, American editors have discovered, of looking at the report of the Naval Court of Inquiry, which gave a "practically" clean bill of health to that part of the marine corps which has been policing Haiti. The report is accepted as "the only finding possible, in the light of all the evidence," by most supporters of the administration; it is derided by radicals and Socialists as a "whitewash," the sort of investigation "so often staged by the British in Egypt and India"; while a third variety of opinion accepts both the investigation and the report with reservations, and calls for a Congressional investigation to lay bare the facts of our activities in Haiti.

The naval inquiry was inaugurated, as the press recall, largely to investigate charges made by Brigadier General George Barnett, former commandant of the marine corps. His letter, made public by the Navy Department some months ago, more than a year after it was written, accused certain members of the marine corps of "practically indiscriminate killing of natives." There was no proper ground for this statement, according to the report of the Naval Court of Inquiry by Rear Admiral Henry T. Mayo, which presents its findings of fact as follows:

"1. The court finds that two unjustifiable homicides have been committed, one each by two of the personnel of the United States Naval Service, and that sixteen other serious acts of violence have been perpetrated against citizens of Haiti during the same period by individuals of such personnel.

"2. The court finds further that these offenses were all isolated acts of individuals and that in every case the responsible party was duly brought to trial before a general court martial, convicted, and sentenced.

"3. The court has found no evidence of the commission of any other unjustifiable homicides or other serious unjustifiable acts of oppression or of violence against any of the citizens of Haiti or unjustifiable damage or destruction of their property caused by any of the personnel in question."

Shortly after General Barnett's accusations became public, Clifford A. Tinker, writing in *The Stars and Stripes*, a soldier weekly published in Washington, on the basis of the court-martial records, incidentally admitted the killing of prisoners without trial or other formality, in a way which aroused widespread protests against "Prussian barbarity," when it was practised by the Germans in the European War. This was quoted in *The Literary Digest* of November 13, 1920. The writers justified these killings on the ground that otherwise the marines would have been "handicapped by their prisoners." He also presented a circumstantial account of the killing of two Haitians, Leonard Placide and Destine Jean, by a marine who afterward went insane, whereas the court allots one "unjustifiable homicide" to each of two marines. The whole report is called "evasive humbug" in a statement issued by the National Association for the Advancement of Colored People, with headquarters in New York. "Obviously, the truth about Haiti cannot be brought out by any military inquiry," says this statement, which accuses the naval investigators of suppressing evidence. The statement suggests a Congressional investigation, and concludes:

"Most of the Haitians were killed in what were called 'caco hunts,' in which fleeing people, often unarmed, were shot down by machine guns

whose bullets did not discriminate between the sexes. In fact, all the killings of the Haitians by marines were 'indiscriminate killings,' illegal and unjustified by international or any law other than that of force."

The Socialist New York *Call* and the liberal *Nation* are almost equally bitter and contemptuous. *The Call* suggests that a Naval Court of inquiry upon the acts of naval forces in Haiti might be regarded as a theme for a comic opera. Far and solidly on the other side of the fence are the New York *Tribune* and the New York *World*, respectively Republican and Democratic, but in thorough agreement on the subject of the marines in Haiti. "Such a charge was out of harmony with the record of the marine corps, with its high reputation for discipline and self-control," says *The Tribune*. "It has earned the gratitude of the Haitian people," comments *The World*. "It is well to have its services more fully known, not merely for the confusion of hostile critics, but in confirmation of the good name it has earned so often in other fields of duty." The New York *Evening Post* concludes an editorial of mild agreement with these encomiums with the observation that—

"This report does not dispose of the question of the justice of our rule in Haiti. President Dartiguenave from the beginning attributed small importance to the naval inquiry. His complaint is against our civil administration, the alleged shortcomings of which he lays to incompetent American officials. Nothing short of a Congressional investigation can get at the facts on this side of our activities in Haiti. All that we have had thus far are obviously biased and extreme charges and official denials."—*The Literary Digest*, Jan. 1, 1921.

MERCHANT MARINE

TRANSPORTATION BY WATER.—To the American boy, whose duty it is to maintain our flag upon the seas now that it has been restored there," runs the dedication of "The New Merchant Marine," by Edward N. Hurley, formerly chairman of the United States Shipping Board. He is proud of his work. "Our new merchant fleet as it floats to-day represents the most spectacular achievements in the history of this or any other country," he tells us, adding "Conspicuous among these achievements was the launching on July 4, 1918, of ninety-five ships in American yards—fully 50 per cent of which yards were in existence a year before."

But what necessitated this frantic haste to build ships? We had ships a-plenty in the old days. "Almost the first industry established on our shores was the building of ships. By the middle of the eighteenth century twelve of the thirteen colonies lying along the Atlantic seaboard possessed regular shipyards, and each colony was producing from 2 to 137 bottoms a year," and everywhere on the high seas went Yankee sailormen. "In addition to covering established trade routes, they engaged extensively in pioneer operations. They sailed direct to the Cape of Good Hope and to Hindustan, Java, and Sumatra. Through the Dutch in the East Indies they carried on an early trade with Japan. Madagascar, New Holland, and New Zealand were among their regular ports of call. Theirs were among the earliest ships on the coast of South America and the West Coast of Africa."

As time went on, the Yankee fleets engaged more and more audaciously in trade. "A Boston merchant named Tudor obtained a monopoly of supplying ice to the city of Havana. Then, there was the American whaling industry. During this period, too, steam propulsion and its concomitant, the famous American clipper-ship, made their appearance. The first steam-vessel to cross the Atlantic was the *Savannah*, American-built and American-owned. The clippers were marvels of speed and strength. With them the twelve-day transatlantic passage was not uncommon; and nine-day voyages, not achieved by steam-vessels until thirty years later, are on record."

By 1850, or thereabouts, "our merchant marine had reached the zenith of its size, glory, and power. Our flag was on every highway of commerce. Our total ocean-going tonnage had reached 2,496,894. Even our new steam

fleet closely approached the size and exceeded the efficiency of England's." But dark clouds were gathering, and ere long came the Civil War, and "between the ravages of Confederate cruisers, the demoralization of our industries and commerce, the sale of our vessels into foreign registry, and the bankruptcy of many of our shipowners, almost half of our merchant marine was wiped out."

National pride stimulated a burning desire to regain our lost supremacy, but desire, in these matters, is not enough. It takes necessity, and our entrance into the World War brought that. Ships had to be built. They had to be built quickly—and were. "The Great War has left on our hands the nucleus of a large merchant fleet with which to re-establish our flag upon the seas. It consists of about 2311 vessels aggregating some 13,600,000 dead-weight tons. There is nothing elaborate about it, for it was built in an emergency for the grim purposes of war. It contains no ocean greyhounds; in fact, only twenty-six of the ships were designed to carry passengers. There are few tankers, colliers, and other special types; but, in the main, its units are carriers of bulk and general cargo, capable of turning up between nine and one-half and eleven knots an hour. They are good, strong vessels of better material, equipment, and workmanship than the old cargo vessels of Europe."

What, now, of the future? There are foreigners who can build ships more cheaply than we can. There are foreigners who can man and sail ships more cheaply than we can. If maintaining our merchant marine is to be unprofitable—that is to say, if outsiders can beat us at our own game—what powerful incentive remains for staying in that game? National pride? If so, how is national pride to translate itself into something practical and tangible? Foreigners have sometimes stimulated the growth of their fleets by grants of money to ship-owners—in a word, subsidies—and for a long time American publicists have urged us to do likewise. To this Mr. Hurley is strongly opposed.

All questions relating to ships and the deep seas are at present befogged with uncertainties. To what extent will our foreign trade develop? To what extent will our competitor's fleets develop? To what extent will private initiative replace governmental initiative in keeping up our new merchant marine? Affairs are at present so unsettled that it is difficult to predict. But meanwhile there is agitation for canals and for improved rivers, and in matters relating to inland waterways we deal with forces under our immediate control. Congress—or a state legislature—can say, "Let a canal be built," and nothing can prevent its being built, even though, as in the case of the New York State Barge Canal, it may cost \$155,000,000.

In "American Transportation Problems," Samuel O. Dunn pays his compliments to the enthusiasts who "paint attractive pictures of great vessels loading at Chicago and St. Louis and steaming without transfer of cargo through the country to the Gulf, and thence to all parts of the world," and reminds us that "this main project is supplemented by numerous minor ones, including the deepening of the Mississippi River to St. Paul and of its various tributaries, and other rivers in all parts of the country; the construction of a ship-canal to connect the lower end of Lake Michigan with Lake Erie; the construction of a ship-canal from Lake Erie to the Atlantic Ocean, etc. The three chief arguments for this plan are (1) that it would cheapen transportation; (2) that it would regulate railway freight-rates; and (3) that it would provide in the best way needed additional facilities of transportation."

How sound are these arguments? As Mr. Dunn goes on to say, "there can be no question that well-managed steamship lines in our coastwise and Great Lakes traffic can generally haul goods more cheaply than railways. The case of *artificial* water-ways, including under this term both canals and improved rivers, is very different. Expenditures analogous to those for the construction and maintenance of a railway's roadway must be made on them; and the expenses of operation caused by the physical limitations of their channels are comparable to those caused by the limitations of a railway's track." These are serious objections, and, as Mr. Dunn goes on

to say, "even if the Lakes-to-Gulf waterway were dug twenty feet, or even thirty feet, it is not probable it would be used by lake or ocean steamships. A lake or ocean vessel is poorly constructed for navigating a canal or tortuous river; its ratio of length to beam is too great and its rudder power insufficient to keep it from frequently running into the banks except when moving very slowly."

Mr. Dunn edits *The Railway Age Gazette* and perhaps might be regarded by some as, on that account, more favorable to railways than to waterways. Railways are not supposed, at any rate, to love canals, or improved rivers, or any type whatsoever of inland waterway. But no such charges of special pleading will be brought against Charles Whiting Baker, consulting editor of *The Engineering News-Record*, and he agrees pretty closely with Mr. Dunn when he sets forth his views in "What Is the Future of Inland Water Transportation?" There we read that "traffic on nearly all inland waterways has all but disappeared. With few exceptions, the competition of waterways with railways is no longer of any consequence. The primary cause of the decline of the waterways is the extraordinarily low cost at which the railways of the United States are able to handle low-grade bulk freight, which is the only class of freight on which the waterways can hope to compete with railways."

By way of conclusion he says, "The only waterways which promise public benefit are those whose terminal expenses favor the waterway instead of the railroad. A deepened St. Lawrence River connection between the lakes and the Atlantic and a ship-canal across New Jersey are the two waterway projects which best deserve attention."—*The Literary Digest*, Jan. 1, 1921.

ADMIRAL BENSON'S REPORT GIVES MUCH USEFUL INFORMATION.—According to the annual report of Chairman Benson of the Shipping Board, the United States on the completion of the government's shipbuilding program by 1922 probably will have as much ocean-going tonnage as all the other countries combined, with the exception of Great Britain.

In the course of the fiscal year 1180 finished ships of 6,379,823 deadweight tons were delivered, exceeding all records. They were built without overtime or other aids to rapid production.

American vessels are now sailing in 229 separate services. They carried 44.6 per cent of the nation's foreign commerce last year as compared with 9.7 per cent before the war, the report said.

The government fleet in operation June 30 consisted of 1294 steel vessels plying to all quarters of the globe, including 508 to Northern Europe and 126 to Southern Europe. In the transpacific service there were 163 vessels, and in the South American 138.

Forty-one direct service lines have been established to South and Central America from nine ports on the Atlantic Coast, four on the Gulf and two on the Pacific Coast.

Discussing the wooden fleet, Chairman Benson said the maximum number in operation was 240 during April. In June there were 170 at work. Government tank steamers carried 3,641,362 tons of oil in the course of the year.

Nearly all seized German cargo craft have been sold or chartered with option to purchase, while all but eleven of the German passenger ships were disposed of in the course of the year.—*The Nautical Gazette*, Dec. 18, 1920.

THE DEVELOPMENT OF WELDED SHIPS.—It is scarcely believable that a wide-spread movement in favor of the adoption of electrically-welded ships will not, in due course, attract a sufficiently large number of skilled mechanics to dissipate the present objection to welding on the part of the majority of iron-workers.

As in other departments of shipbuilding, thorough mastery of the welding art, can only be obtained by actual experience in the various branches of the trade, and not in so-called welding schools. Hence the welders

should be selected from the handiest ship workers, boilermakers, and forge shop helpers, men who have learned heat treatment and how to handle tools over several years. The degree of intelligence they show in handling the arc will indicate the measure of their success as welders.

It is suggested that in the preparation of drawings and shop orders for the fabrication of welded structures, the designer should keep constantly in mind the smaller dimensions of the plating required because of substituting open butt joints for the customary riveted laps. He should also take advantage of the many opportunities for eliminating angles and other junction members so essential for riveted jointures, but wholly unnecessary for electrically-welded seams. It is also recommended that the designer consult freely with the welding engineer when developing the lay-out of new work as, between them, more efficient and economical results are secured. (*Pacific Marine Review*, Sept., 1920).—*The Technical Review*, Dec. 14, 1920.

EFFECT OF DEPTH OF WATER ON RESISTANCE.—Experiments have shown that the resistance of a ship may be influenced by the presence of the bottom at high speeds, when the depth is so great as twenty times the draft.

The author sets out to answer the following questions: (1) Where does the increase in power begin? (2) Where is it greatest? (3) How great is the maximum increase? (4) Where do the resistance curves for deep and shallow water cross again? (5) How great is the subsequent reduction in power? But he confines himself chiefly to questions (2) and (3). From an examination of trial results of ships of different sizes it appears that there is a critical speed for each depth of water at which the increase in resistance is greatest. This speed depends only on the depth and can be obtained approximately from the formula—critical speed $= 7.1 \sqrt[2]{\text{depth of water}}$. The point of intersection of the resistance curves for shallow and deep water lies at such high speeds as can only be reached by very fast warships. The amount of the increase of resistance has been found to depend on the ratio

$$\frac{\text{Area of midship section}}{\text{Breadth of ship} \times \text{depth of water}}$$

which may be called the "contraction of the area of flow." It is quite independent of the value of the critical speed. Model experiments show similar results, but the influence of the restriction caused by the sides of the tank is felt as well as that of the bottom, and the formula for the critical speed becomes $2.54 \sqrt[2.76]{\text{depth of tank}}$, which is different to that obtained from actual ships. The amount of the increase, however, is still found to depend on "the contraction of the area of flow." It is important for comparison between models and full-sized ships that curves for deep and shallow water in both ship and model cross at the same corresponding speed. Thus it is possible to apply the law of comparison with sufficient accuracy if the position of the maximum increase is adjusted so as to agree with the critical speed for the real ship in the depth of water to be used on the trials. The percentage increase in power at this point will be that obtaining in the model at the critical speed in the tank. Thus a displacement of the hump on the resistance curve can be made, while keeping the crossing points fixed.—*The Technical Review*, Dec. 21, 1920.

CONCRETE SHIPS.—From the experience of the U. S. A., reinforced concrete ships are proving satisfactory.

Vibration in these vessels is smaller than in steel ships, and the period of roll is longer, a very desirable quality, due to the fact that these vessels have a greater moment of inertia owing to the weight of the hull being heavier.

On the other hand, experience shows that they are not so capable of standing hard knocks, the cement breaking away. Where a blow on a steel ship would only bend a plate, in a concrete ship it results in a large

area in the neighborhood of the point of impact being damaged. It is true, however, that the repair of the damage can be easily and quickly carried out. For heavy cargoes, iron and oil, where the maximum weight of the cargo is reached before the hold capacity is filled, the steel vessel has the advantage; but with ordinary cargo, such as general goods, cotton, fruit, etc., the concrete ship has the advantage, as in the steel ship the vessel is filled to her capacity before the max. d w. load is reached. Concrete ships can be built as quickly as those of steel, and with longer experience the time may be shortened, and also the cost reduced. The vessels in service have not shown any special indication of deterioration that would tend to reduce their life. (*Rivista Marittima*, July-Aug., 1920.)—*The Technical Review*, Dec. 21, 1920.

AERONAUTICS

THE DEVELOPMENT AND CONSTRUCTION OF THE CAPRONI AEROPLANES.—The author gives full details of the developments of the Caproni aeroplanes, and compares their characteristics and performances with German machines of similar construction.

The author illustrates and describes the various machines built by Caproni, beginning with the 100-horsepower Gnome-engined biplane, then the 100-horsepower Fiat-engined biplane, and the 150-horsepower Isotta Fraschini-engined biplane. He then deals with the successive 3-engined designs of 200-300-horsepower up to 600-900-horsepower biplanes reconstructed for commercial use, and finally, he describes at length the various triplanes built for commercial use up to 2000 horsepower. Tables are given showing the respective time of flight, fuel consumption, distance of flight and load-carrying capacity of the various types.

The author draws the conclusion that the cause of the relatively low carrying capacity is due to the fact that Caproni is aiming at a light net weight of machine and in order to achieve this requires many struts and a complex bracing system, which by greatly increasing resistance, reduces the ratio of lift to resistance, resulting in smaller load-carrying capacity. The German designers rather prefer a greater net weight of the machine by strengthening the construction without the use of many struts and bracing wires, and thus increase the ratio of lift to resistance. (*Der Motorwagen*, Sept. 20, 1920.)—*The Technical Review*, Dec. 21, 1920.

THE GERMAN AIRSHIPS "L-64" AND "L-71."—An article dealing with some of the more interesting points of construction of these vessels, which were handed over to Great Britain.

L-64, the older of the two, which was actually engaged in raids over London, has four gondolas equipped with 300-horsepower Maybach engines; *L-71* has six gondolas similarly equipped. For the exhaust system a novel arrangement has been adopted whereby a large saving in weight is effected. Bolted to the exhaust ports is the exhaust manifold, which consists of mild steel pressings soldered together. Both manifold and exhaust pipe are entirely enclosed in an aluminum jacket, and the exhaust outlet, which is turned aft towards the propeller, is used to induce a strong draft of air through the space between the jacket and pipe, effectively cooling the system. (*Automobile Engineer*, November, 1920.)—*The Technical Review*, Dec. 21, 1920.

COAST-TO-COAST FLIGHT IN 24 HOURS PLANNED.—An attempt to fly 2079 miles from Florida to California in an aeroplane in 24 hours will be made February 22 by Lieutenant Alexander Pearson, Jr., Major Henry C. Pratt, air officer of the 8th Corps area, announced Lieutenant Pearson who won the transcontinental air race last winter.

The flight will be made in three "hops." The starting point will be Pablo Beach, Jacksonville, Fla. The first hop of 804 miles, will be made to Ellington Field, Houston, Tex.; the second from Ellington Field to El Paso,

a distance of 660 miles, and the third is scheduled from El Paso to Rockwell Field, San Diego, Calif., 615 miles.

The flight will be the first attempt to cross the continent for a continuous speed record, the two necessary stops only requiring 45 minutes.—*The Aerial Age Weekly*, Dec. 27, 1920.

"NC" SEAPLANES FOR FLEET OPERATIONS.—Five of the large NC seaplanes have been assigned to operate with the U. S. Navy fleets, three on the Atlantic and three on the Pacific. These seaplanes, carrying a crew of five men each, will be employed on scouting problems and long distance work, for which they are well adapted, being fitted for navigation on the surface and with the radio direction compass. The definite program for their employment is being worked out by the Fleet Air Detachment commanders, Capt. George W. Steele, Jr., U. S. N., of the U. S. Atlantic fleet, and Capt. H. C. Mustin, U. S. N., of the Pacific fleet. The NC seaplanes will have destroyer tenders for these operations. This is the first time NC seaplanes have been used.—*The Aerial Age Weekly*, Jan. 3, 1921.

ENGINEERING

THE ELECTRIC-ARC WELDING OF STEEL: THE PROPERTIES OF THE ARC-FUSED METAL.—A fusion weld is fundamentally different from all other types in that the metal of the weld is essentially a casting. The arc-fusion weld has characteristics which are peculiar to it alone. A knowledge of the mechanical properties of the arc-fused metal which is added during the process of welding is fundamental in the study of arc-welding. The mechanical properties as revealed by stressing in tension were determined upon specimens (0.505 inch diameter, 2 inch gage length) cut from blocks of arc-fused metal prepared under conditions similar to those met in welding. Additional specimens were also prepared by expert welders outside of the bureau and submitted for comparison with those prepared by the bureau.

Two types of electrodes, a "pure" iron and a low-carbon steel, were used. During fusion the composition changes considerably as the carbon and other elements are eliminated. The two types of electrodes become very much alike in composition. In each case a considerable percentage of nitrogen is taken up.

The mechanical properties of the arc-fused metal as measured by the tension test are essentially those of an inferior casting. The most striking feature is the low ductility of the metal. All of the specimens examined (about 70) showed evidence of unsoundness in their structure, tiny enclosed cavities, oxide inclusions, and lack of intimate union. These appear to be a necessary consequence of the method of fusion as now practised. They determine almost entirely the mechanical properties of the metal. The observed elongation of specimens under tension is due to the combined effect of the numerous unsound spots rather than to the ductility of the metal.

The material is, however, inherently rather ductile, as may be shown by the changes produced in its microstructure by cold-bending.

A characteristic feature of the microstructure of the arc-fused metal is the presence of numerous microscopic plates within the ferrite grains. These persist in the metal upon prolonged heating, for example, 6 hours at 1000° C. in vacuo were not sufficient to remove them. The various lines of evidence available indicate that they are related to the nitrogen-content of the metal.

The microscopic examination indicates that there is but little, if any, relation between these so-called "nitride plates" and the path of rupture produced by tensional stresses. The effect of the grosser imperfections of the metal is so much greater than any possible effect of these plates in determining the mechanical properties that the conclusion appears to be warranted that this feature of the structure is a matter of relatively minor importance in ordinary arc welds.

Judged from the properties of the metal after fusion, neither type of electrode used appears to have a marked advantage over the other. The use of slight protective coatings on the electrodes does not appear to affect the mechanical properties of the arc fused metal materially in any way. The specimens were prepared in a manner quite different from that used ordinarily in electric-arc welding and so do not justify specific recommendations concerning methods of practice in welding.—*The Franklin Institute*, January, 1921.

SHIPYARD TESTS PROVE WELDING WILL SUPERSEDE OLD METHODS.—In view of the sensational notices that have been issued from time to time, regarding the miracles of electric welding, the actual fact test becomes important. New England's greatest shipyard, Fore River, has been giving over a year's time to trying out the actual, practical, enduring and time-saving and cost-cutting worth of welding by the oxy-acetylene method.

While it has been rumored that "riveting is ended in this yard and o-a is to take its place," it may be remarked that the double, and "triple-curved," plates on certain parts of submarines, etc., are not welded as YET. But testing for a considerable period has developed the following as the result of Fore River's experience.

When the plates come into the steel mill and are taken off the moulds the oxy-acetylene contrivance, known among the men as the burning torch, cuts openings for hatches and door, pares down edges to conformation with lines of the moulds and cuts the lightening holes and innumerable other cuts and openings that are too costly or too difficult to make with the punches, shears or drills.

Torches in the Smithy.—At the smithy building, the "burning torches" make holes in girders, notch frames and angles, split steel beams, and perform numberless jobs for or in connection with the smith work. Gun foundation rings are here joined, blower trunks and smokestack rings, add pieces to staples and other important basic or incidental work formerly done by smithy, driller or chipper now is largely done by the burner.

Gradually it has gotten so that hither-to-ridiculed uses of oxy-acetylene methods have been found by repeated tests to be thoroughly practical. Trolley supports and boat davits are split by the burner and bent into the required shape by the anglesmith, then are swiftly welded into permanent pieces by this new method. Stiffener-bars are likewise split and welded, condenser frames are formed and false corners plugged and made solid pieces. Spot-welding machinery is now employed to a great extent on fundamental pieces, in many lines doing away with the use of rivets entirely! (I put an exclamation point here because, in actual shipyard work, it is known to be wonderful that riveting can even partially be done away with!)

Irregular Shapes Made.—Go through an inspection of the assembling space and you find renewed evidence of the indispensability of the oxy-acetylene device. Irregular or special shapes and forms are fitted with special shapes cut out or fitted by the burners. Welders pad bulkheads, join bars, tighten corners and perform an hundred of the emergency, special-need and otherwise-impossible feats that are constantly required, despite the finest of planning and blue-printing, in every craft that leaves the plant. Rings are secured with welded strips that are drilled for the requisite number of rivets.

The giant tanker Baldbutte which recently went into commission from Fore River is the most up-to-date specimen of the all-round use of the oxy-acetylene method. It is evidenced to a remarkable degree all through this huge craft.

Before the ship was anywhere near ready for launching the burners served numerous departments by cutting holes and areas for pipe systems, electrical systems, ventilation, etc. In the alteration of plans—one of the puzzling and inevitable brain-rackers for shipbuilding experts—it may now be said that the burning torch is the main, and in some cases, the only, dependence for making alteration possible.

Use in Naval Construction.—While destroyers are, to most visitors, pretty well packed with details and variety of equipment, the submarine is a veritable tube of costly, delicate and compactly-stored machinery. Thus a submarine which, in the rough, is worth \$1,000,000 goes out of the yard with devices that bring its price up to \$4,000,000.

Back in the shops welding plays as consuming a part as it does in a finished tanker or submarine. Welding has superseded riveting in sheet metal departments for making ventilating pipes, inspection tanks, bins, racks, frames, windshields, gravity tanks, drums, heads, cylinders, drain boxes, gear covers, port casings, etc.

And in conservation—few realize how welding has revolutionized things! Parts of broken tools, of the costliest, high-speed steel are welded on to inexpensive shafts and thus saved for weeks or months of practical service when they would, otherwise, be consigned to the junk pile. Pneumatic and electrical tools and pieces are put back into efficiency by the oxy-acetylene route.

Go to the Baldbutte and find that the hatches over the engine-room, boiler-room mess and galley are welded! Awning stanchions, railing stanchions and even the staff from which the flag floats are fastened in place by the burning torch method.

And steadily is the manifold necessity and use of o-a developing. Developing as severe testing and experimenting prove that it positively IS the quickest and most solid method. While riveting has not been "driven from shipyards," it does seem, to one familiar with what is now going on there, that it is steadily being driven toward the discard!—*The Nautical Gazette*, Dec. 18, 1920.

POWDERED COAL FOR POWER-PLANT BOILERS.—Recent successful application of powdered coal to steam boilers seems to mark an introduction to a period of transition in the art of burning coal under power-plant boilers. This transition may be similar to that through which the steam prime mover passed during the last fifteen or twenty years. During this period the steam turbine in large power-plant service has supplanted the reciprocating engine, although it is true that there are many more steam engines made and sold to-day than 20 years ago. It seems probable that within a few years powdered coal in a similar manner will supplant in certain fields the mechanical stoker, while in other classes of service the stoker may extend its service because of its peculiar adaptation, just as the steam engine is holding its own against the steam turbine in its particular field.

There are in the United States several plants burning pulverized coal with sufficient success from the viewpoint of over-all efficiency, service and reliability of operation to warrant investigation of the possibilities when new plants are under contemplation. The over-all operating efficiency of a plant using powdered coal is higher than it is with other methods of burning. The gain in economy is due mainly to low heat losses in the chimney gases, an unusually small amount of combustible in the ash and to the fact that no coal is burned during banking hours.

In the chimney gases the heat losses are low because powdered coal can be burned with little excess air and it is easy to maintain the right proportion of coal and air fed into the furnace. The air infiltration into the setting is small because only nominal draft is required. Owing to the low excess of air a relatively small volume of gases needs to be moved through the boiler, and there is no fuel bed to impede the passage of the air to the furnace.

With proper furnace and burner design the combustible carried away with the ash is so small that the loss due to this cause need not exceed 1 per cent of the heat in the coal fired. No coal need be burned when the boilers are banked, as usually the fire can be lighted and made effective within less than five minutes.

As the excess of air and the completeness of combustion can be controlled easily, all coals give equally good service and efficiency. The

evaporation is directly proportional to the heat value of the coal, so that coal can be bought on the B. t. u. basis. With a well-designed and operated powdered-coal furnace it is possible to remove the ash without hindrance to operation. Comparatively little repair work on the furnace lining should be necessary. It has been said that boilers fired with powdered coal are limited in capacity. The capacity that can be developed efficiently depends entirely upon the size and proportion of the furnace. This is true of all other methods of burning coal, although perhaps this fact is not appreciated generally by power-plant designers. In a properly designed powdered-coal furnace the ordinary bituminous steaming coal can be burned almost completely at rates of combustion up to two pounds of coal per cubic foot of combustion space. It may seem that powdered coal requires large combustion volume, but it should be borne in mind that all the space occupied by the ashpit and air ducts in the stoker installation is available as combustion space in a powdered-coal furnace. It is a fact that stoker furnaces installed in the past have had entirely too little combustion space, but during the last few years the necessity and advantages of large combustion volume has been appreciated by the more progressive stoker manufacturers, and they now demand that boilers be set high above the floor to give large combustion volume over the stokers.

Another objection frequently raised to powdered coal is that a large part of the ash is carried away with the chimney gases and deposited in the neighborhood of the plant. This objection is not nearly so serious as represented. In well-designed plants much of the ash can be deposited at the bottom of the furnace, in the chambers under the rear part of the boiler, in specially provided pockets in the smoke flue and at the base of the stack. Experiments have shown that not over 15 per cent of the ash in the coal need be discharged into the atmosphere with the chimney gases. This quantity compares favorably with that carried away from other types of furnace. From well-designed and well-operated powdered-coal plants the dust is very fine and is carried a long distance. It is brought down only by rain and deposited over large areas in quantities so small that it cannot be observed. It is like fine beach sand and does not smudge.

Another objection usually made against powdered coal is that the cost of preparation is too high and nearly offsets the gain in boiler efficiency. This objection might have been justified in some of the first attempts to burn pulverized coal with poorly designed furnaces and burners. From these experiments conclusions were made that in order to burn powdered coal successfully it was necessary that the coal should contain less than 1 per cent of moisture and that at least 85 per cent of the coal should pass through a 200-mesh screen. Of course such preparation of coal would be costly. It seems now possible that the cost of pulverizing coal need not be in excess of the cost of supplying air under pressure to forced-draft stokers.

The pulverizing mills will stand considerable improvement and simplification. Much of the energy used in driving these mills is spent in useless work, and it is probable that mills will be developed using two-thirds or even one-half of the power now required to pulverize coal and thus further reduce the cost of preparing the fuel.

It was not until about three years ago that the work of successfully burning pulverized fuel under boilers in plants where the efficient generation of steam was absolutely essential was accomplished. From that time until about five months ago there was nothing radically different in the methods employed. Beginning last August, however, some courageous steps were taken to ascertain to what limits the old order of things could be changed with a view to improving both operating conditions and efficiency. As a result some discoveries have been made and acted upon, and it would appear as if still further developments are imminent, so that the future looks full of possibilities for the improvement of the preparation and of the methods of burning pulverized coal.—*Power*, Jan. 4, 1921.

ALUMINIUM ALLOYS.—The metallography and physical properties of a number of alloys of aluminium with copper, magnesium, iron, nickel, manganese and zinc are described, and a number of practical notes are included.

A number of micrographs of aluminium alloys are given, the structures being examined and accounted for, theoretically. It is shown, for example, that the copper compound CuAl_2 formed dissolves in solid aluminium up to about 4 per cent of copper at 500°C . Above about 4 per cent, a eutectic forms between CuAl_2 and aluminium- CuAl_2 solid solution. The variable solubility of the CuAl_2 with change of temperature makes it possible to change the properties of these alloys by suitable heat treatment. In the case of iron-aluminium alloys when about $\frac{1}{2}$ to $2\frac{1}{2}$ per cent of iron is added, FeAl_3 is formed as needle-like constituents, which have a strengthening effect upon most aluminium castings by virtue of the fact that the normal eutectic network is made less continuous. As the fracture in nearly all castings occurs in the eutectic network, the FeAl_3 needles make the path of rupture greater and increase the breaking load, as well as giving a higher elongation.

When 2.75 per cent copper, 7 to 8 per cent zinc, and about $1\frac{1}{2}$ per cent of iron is added to aluminium, the iron needles form in several places; CuAl_2 is also formed, and the zinc is present without forming a complete network. This alloy is strong and ductile, having an average tensile strength, in the green-sand cast state, of about 12 tons per sq. in., with an elongation of 4.5 per cent.

The phenomena of growth and ageing are described at some length; it is stated that in the case of the old No. 12 alloy, sand cast, that the strength and ductility changed appreciably even after only 24 hours, the change persisting for several months. Usually the strength slightly increases and the ductility decreases. In the case of copper-aluminium alloy, as cooled in the ordinary methods of production, upon reheating to a temperature of 300°C ., a permanent increase in volume always takes place; petrol engine alloy pistons all experience this growth.

The effect of zinc in increasing the tensile strength is shown graphically; from the curve it is evident that with pure aluminium (cast) the tensile strength is 13,000 lbs. sq. in., with 3 per cent zinc, 14,000 lbs. sq. in.; with 7 per cent zinc, 18,000 lbs. sq. in.; and with 12 per cent zinc, 25,000 lbs. sq. in. The elongations for the above values are 19, 18, 14 and 7 per cent respectively on 2 inches. With 10 per cent of copper the tensile strength is increased from 13,000 to 20,500 lbs. sq. in., and the elongation is reduced from 19 to 0.6 per cent.

Temperature curves are given for two types of alloy, one being known as 145 Lynite, which consists of 2.75 per cent copper, 7 to 8 per cent zinc, and over 1 per cent of iron. The tensile strength at 0°C . is 30,000 lbs. sq. in., whilst at 100° , 200° and 300°C . it is 25,000, 16,000 and 9000 lbs. sq. in. respectively. The corresponding elongations on 2 inches length are 8, 10, 14 and 21.5 per cent respectively. A comparison is also made of the stress strain values of cast aluminium alloy with those of machine steel, and results of fatigue tests made on these metals are discussed. It is stated that an aluminium alloy casting similar to the one last described will break after 500,000 reversals, when stressed to 14,000 lbs. sq. in.; when stressed to 8500 lbs. sq. in. it will break with 16,000,000 reversals. But mild steel, having a tensile strength of 65,000 lbs. sq. in., a yield point of 30,000 lbs. sq. in., and elongation of 30 per cent, will break with 16,000,000 reversals, only, when stressed to 12,000 lbs. sq. in.

The author proceeds to describe the foregoing alloys of aluminium, their properties and methods of working. (Z. Jeffries, Paper read before the Detroit Section, Society of Automotive Engineers, *Aviation*, Oct. 1, 1920).—*The Technical Review*, Dec. 14, 1920.

RADIUM—A NEW ELEMENT IN THE SAFETY MOVEMENT.—Radium, the most mysterious and most powerful element known to science, which has the

greatest power of all discovered sources of energy, has now been linked with the Safety Movement and will lend its power to the prevention of avoidable accidents.

Radium is best known to the world through its curative properties in the treatment of cancer and through its commercial value in making radium luminous material. The power and curative properties of radium were made known only a few years ago through the efforts of a Polish woman scientist, and a French and an American professor. Radium is now used in the treatment of thousands of cases of cancer annually, with encouraging results.

Radium's rôle in industry as a life saver is less spectacular, but perhaps even more important than it is as a therapeutic agent. The great mass of accidents in factories, in mines and in other industrial institutions where darkness is a creator of danger, are being eliminated through the newest invention of science—radium luminous material. Radium illuminated watches are familiar articles. The same material that illuminates these is now being employed in great factories on all power line switches where fumbling might mean electrocution to the operator.

Electric switches are often set in places which are unlit. This includes electric lighting equipment which is usually visible only after the light it controls has been turned on. A spot of radium luminous material on the bottom of a switch makes them easily located in the dark, so that in emergency they may quickly be made use of.

Likewise, a fire alarm or a fire extinguisher is deprived of a good deal of its efficiency, through being invisible in the dark. Radium luminous material acts as a quick locator for them.

While radium is the most valuable element in the world—a gram of radium costs \$120,000, as opposed to \$150 for an ounce of platinum. So powerful is it when mixed with other materials that even the minutest particle is effective in making material self-luminous for years. It is this quality which makes radium luminous material commercially possible.

The great value of radium is due to its scarcity and to the great difficulty in isolating it after it has been found. Much of the radium of the world is now found in America, in mineral deposits of carnotite. A great portion of this comes from the Undark Radium mines in the Paradox Valley of Colorado.

The ore is found in narrow seams in the ground. It is sorted and packed in one hundred pound sacks and transported sixty miles to the nearest railroad station on the backs of burros and mules. Thence it is shipped in car-load lots 2900 miles across the continent to an extraction plant in Orange, N. J.

Two hundred fifty tons of ore treated with an equal amount of chemicals and water yields one gram, which is about the size of a pin head.—*Industrial Management*, December, 1920.

THE DESIGN OF DIESEL ENGINES.—Otto Alt, chief engineer of the Germania Shipyard (Krupp's) outlines the progress hitherto made in the design and construction of Diesel engines and forecasts the main trend of design to be followed by Krupp's.

After particulars are given of the Diesel engines constructed for certain German U-boats, reference is made to the fact that the firm intend to specialize mainly in the four-stroke type of engine.

Dealing with the problems of design, reference is made to torsional vibrations of the engine shafts and the work carried out by Gümbel and others, from which the following conclusions emerge: (1) The shafts of marine engines should, where possible, be so dimensioned that the range from 0 to the maximum revs. is as free from vibrations as possible. In this connection it is sufficient for the critical speed of the second degree and sixth order of, say, six-cylinder engines to be about 20 per cent above the maximum speed. (2) If dangerous critical speeds are still present

within the given range, they should be so distributed as to be below the working revolutions.

As regards lubrication and the danger of carbonized oil getting into the bearings, Messrs. Krupp get over this difficulty in the case of uncooled pistons, by making the piston head double, *i. e.*, having a dummy head outside which gets red hot, the inner head remaining cool. Special oil purifying plant should be provided to filter dangerous particles. In the case of the larger 2-stroke engines the pistons are water-cooled. In order to prevent water getting to the oil, the manifolds for the inlet and outlet of the cooling water are, in the case of Krupp engines, placed outside the crank chamber.

The port method of scavenging has been successfully applied to large two-stroke Diesel engines, so that it is probable that the valveless two-stroke will entirely replace the valve type in future.

As regards the combustion process in the Diesel engine, the three usual methods of fuel injection are discussed, *viz.*, compressed air, spring-pressure, and separate chamber or retort. The writer is of opinion, for reasons set forth by him, that the spring method is only suitable for the lower-duty engines. The separate hot-chamber or retort method, due to Steinbecker, has been tried by Krupp's, with satisfactory results. In this method the fuel is introduced (by a fuel pump placed in the cylindrical head) into the injection channel when the piston is about 3° from the upper dead center. Part of the fuel passes with the air into the retort, which is filled with very hot air at a pressure of about 30 atm., and here it ignites and raises the pressure in the retort to about 60 atm. This rise of pressure blows the fuel admitted into the injection channel by the pump into the cylinder. The question of oil-vapor formation is discussed, together with the ignition temperatures, the final compression pressures and the final compression temperatures of vaporized oils. The means of preventing overheating are also considered. A simple criterion for the heating to be expected and the choice of a design to meet it seems to be the quantity of heat transmitted per square meter of combustion chamber area per hour. This is derived from the equation:

$$q_0 = \delta \times q \times n \times D \times p_c,$$

where q_0 is the quantity of heat, in cal., passing through each sq. m. of surface of the combustion chamber per hour; δ , a coefficient depending on the number of cycles, the piston stroke and the time of injection; q the quantity of heat, in cal., passing through the area of the combustion chamber per hour per h. p.; n the r. p. m.; D the diam. of cylinder in meters, and p_c the mean effective pressure in kg./sq. m.

The writer is of the opinion that it is not possible to increase the efficiency of the fuel energy in the Diesel engine above the maximum of 35 per cent already attained.

In conclusion, the question of increased efficiency or duty and the pros and cons of the two- and four-stroke cycle systems are discussed. (*Krupp'sche Monatshefte*, Sept., 1920.)—*The Technical Review*, Nov. 23, 1920.

PROPOSED SEVERN BARRAGE.—A project that the *Engineer*¹ (London) refers to as "a somewhat grandiose scheme" is the utilization of the ebb and flow of the tides in the River Severn for the production of electrical energy. Briefly stated, the proposal is to construct a dam across the river near the place where the tunnel now crosses under it, and by the employment of turbines and electric generators to provide a continuous supply of energy in excess of half a million horsepower during a ten-hour day with a peak capacity of over a million horsepower. The necessary storage feature is to be provided by using excess energy at times of maximum production to pump large volumes of water into a high-level reservoir, the power produced by this water in falling again to sea level being

¹ Note see Current Naval and Professional Papers List.

employed to produce current to fill up the valleys that would otherwise exist in the normal production curve. It is estimated that the potential tidewater power on the Severn with a maximum rise and fall during spring tides of about 30 feet is considerably greater than that of Niagara Falls and largely in excess of the water power of the United Kingdom put together.

There are available four principal outlets: (a) To local manufacturing interests, for which the surrounding country is admirably adapted geographically; (b) to the industrial area of South Wales, all of which lies within a radius of 50 miles of the proposed development; (c) to the vicinity of Birmingham, which is approximately 70 miles distant, and (d) to London, 115 miles away, where the Severn power would be used to relieve the peak load of local generating installations.

The proposed development has been formulated by the Civil Engineering Department of the Ministry of Transport, the names of Sir Alexander Gibb and Messrs. J. Ferguson and T. R. Menzies being mentioned as principally responsible for the engineering and economic features involved. It seems that the Ministry of Transport is interested in the matter because of the lack of sufficient railway communication between South Wales and other parts of the kingdom and the need of access over the Severn estuary for vehicular traffic. Hence the idea of a low-level crossing to accommodate both rail and road traffic and to be used also as a dam or barrage for impounding water to be employed for the production of electric energy.

An important feature of the proposed development is a locked basin for shipping purposes over 27 square miles in extent, suitable for the accommodation of ocean-going vessels, which would be usable at all tides. A locking basin capable of taking the largest ships is to be constructed on the line of the navigable channel and intersecting the barrage, and it is proposed to lead ships into and through it by electric locomotives in a way similar to that employed in the Panama Canal. The railway and road traffic will be passed over one end or the other of the basin by means of lifting bridges, operating in such a way as to insure that there will be no delay either in railway, road or river traffic, the railway being for this purpose duplicated in the form of a loop where it crosses the locking basin.

As to the financial aspect, the *Engineer* says: "No figures are given in the official document as to the first cost of the scheme as a whole, but published guesses at it have varied between £8,000,000 and £30,000,000. It is stated, however, that the estimated cost for generation at present-day prices is a little over $\frac{1}{2}$ d. per Board of Trade unit. It is claimed that, incidentally, the utilization of the power derived from the operation of the scheme would effect a saving in coal consumption of from three to four million tons per year, which quantity would become available for export and would result in the amelioration of the living conditions in the great industrial areas."—*Power*, Jan. 11, 1921.

ORDNANCE

AUTOFRETTAGE METHOD OF GUN CONSTRUCTION.—Investigations are on hand by the U. S. Ordnance Department with a view to comparing the merits of the "autofrettage" method of constructing guns with the more ordinarily used built-up and wire-wrapped methods.

In the autofrettage method of gun construction, the gun may be constructed in one piece. Before the bore is finally completed, hydraulic pressure is applied, sufficient to cause an actual expansion of the gun. The elastic reaction which takes place after the hydraulic pressure is removed places the inner parts of the wall of the gun under compression and the outer part under tension, which is the same general effect as is obtained in the built-up or wire-wrapped constructions. The autofrettage method, if satisfactory, will probably prove cheaper than either of the other two. Furthermore, it will materially quicken the speed of production, and it

may be possible to obtain a gun of equal power but lighter weight. (*Military Engineer*, Sept-Oct., 1920.)—*The Technical Review*, Oct. 26, 1920.

THE WARSHIPS OF TO-MORROW.—The writer considers the problems of types in a very thorough manner and with special reference to the lessons taught by the late war.

He infers that the day of the large battleship is not over. A less caliber than 380 mm. for capital ships is not to be considered; the ideal ship should carry a maximum of 12 guns disposed in four triple turrets rather than in three quadruple or six twin turrets; six is the minimum large caliber guns that should be mounted, so as to ensure effective fire control and good shooting. Despite their effect on stability, superimposed turrets should be retained so as to secure the maximum radius of action ahead and astern. He advocates a secondary armament of 152 mm. guns well protected, and an anti-aircraft armament consisting of six guns about 100 mm. caliber, with a number of machine guns for defence against aircraft that may fly low. Above-water torpedo tubes should be mounted in triple or double units to the number of 7 to 12. Armor, both horizontal and vertical, should be as heavy as possible, compatible with the tonnage of the vessel and its speed. The writer admires the system of protection in the German ships, which enabled so many of them to make port after suffering serious damage from shells, torpedoes, and mines. Speed is a question about which there is some difference of opinion, but for a power which might have to wage a war of attrition (Italy, for example), he recommends that their capital ships should be heavily enough armed and protected to stand up against the enemy's battle cruisers. They might have a less speed than the latter, but must have three or four knots in hand compared with his battleships, which are probably of greater tonnage and offensive power. Powers which cannot afford the mastodon battleship must employ smaller units and adopt strategy and tactics which will preclude the possibility of the enemy forcing an engagement with a superior fleet, but will enable them to draw them into mined areas or favorable positions for torpedo attack, and thus wear them down. (Romeo Bernotti, *Rivista Marittima*, July-Aug., 1920.)—*The Technical Review*, Dec. 7, 1920.

MISCELLANEOUS

SAVING THE NATION'S CELEBRATION.—Human inertia is the greatest drag on the wheel of progress. The stranger or the strange idea is always suspect. National and racial habits and prejudices are harder to eradicate than evil habits in the individual. It has taken America one hundred and thirty-one years after adopting the first written political constitution in the world to concede to women their constitutional right of franchise. England will as soon give up its king and its holy lords as its system of weights and measures—both relics of a primitive age—so strong is the tyranny of the dead over the minds of the living.

So great is this inertia that we find as enlightened a body as the Hartford Chamber of Commerce voting against the adoption of the metric system. They reject an instrument which effects such a saving of time—time which is of the very essence of life—time which the proverb says is money, as employers know to their cost. Who will ever calculate in life lengths the time wasted in the highest paid branch of engineering by the use of utterly unnecessary processes of multiplication and division, with an infinity of factors, and the checking and correcting of errors?

Our brutally arbitrary standards of feet and inches having no basic relation to our gallons and pounds, what a complex process it is to reduce cubic feet to gallons or pounds? Our foot is supposed to be the length of an English king's foot, although there were some kings more generously endowed than others with both feet and understanding. The gallon and the pound have not even this poor basis to build upon.

How different it is with the metric system in which there is nothing arbitrary and no two things unrelated! The meter, the one ten-millionth

part of the quadrant of the Paris meridian, is directly related to the liter, the standard of capacity, which is a cubic decimeter, and the gram, the weight of a cubic centimeter of water at four degrees centigrade. How different are the meter, the liter and the gram when compared with our foot, gallon and pound! How easy it is to reduce meters to liters and grams as compared with the kill-brain process of converting feet into terms of gallons and pounds!

How much more difficult it is to multiply or divide by $61\frac{1}{2}$, 268.8, 537.6, 2150.42 or 1.244, when we wish to reduce a given quantity into pounds, pecks, bushels, gallons, inches or feet, than the mere changing of the position of a decimal point!

How few can tell off-hand how many cubic feet or inches in a peck, a bushel, or how many pounds in a cubic foot of water? How many college graduates can tell you? Recently when an engineer testified in court that a cubic foot of anthracite weighed 54 pounds not a single judge or lawyer questioned the accuracy of the statement until a miner in the audience said in a stage whisper: "He's thinkin' av Ivory Soap!" Yet a French school boy will convert liters and decimeters into grams at your will. Oh, the brutal waste of the life of holy childhood in learning these endless tables designed by madmen dead and damned!

Let us have the rational metric system, which is as far ahead of our foggy measures as the harvester is beyond the sickle, or the electric motor is in advance of the ox. Why should we lag behind the Latins under the coercion of custom and the ghosts of other days?—*Chamber of Commerce Journal*, Scranton, Pa.

DISARMAMENT POSTPONED.—The time "is not ripe" for the disarmament of the world, thinks Senator La Fontaine, Belgian delegate to the League of Nations Assembly at Geneva. The fact that the Senator is the president of the Belgian Peace Society and a Nobel Peace Prize winner makes his statement all the more remarkable. Britain and France, we are told by the Geneva correspondent of the *New York Times*, "in view of the unsettled state of world politics, to say nothing of the fact that the United States, Germany, and Russia are still outside the League," will make haste slowly in the matter of disarmament. France not only wishes to be sure that Germany is thoroughly disarmed and kept in that state before she will act, but is also curious as to the armament policy of other nations. All nations agree, says the correspondent of *The Times*, that "the cooperation of the United States is essential if disarmament is to become real and general," and that "League leaders insist that whether America joins or not she will always be interested in disarmament and can afford to take in proposed discussions of the subject." Following close upon this dispatch, however, came the President's declination of the League's invitation to send delegates to take part in disarmament discussions "in a consultative capacity," although disarmament, in the words of the President, "is so necessary for the economic rehabilitation, peace, and stability of the world."

A day or so later, General Bliss, a member of the American Peace Commission, suggested that the United States "take the lead in a definite peace proposal and demand for a reasonable limitation of armament," since the League, which had been deliberating upon the question for more than three weeks, concluded that "disarmament of the world must be a slow and gradual process." The League, however, according to the *New York Tribune's* Geneva correspondent, approves the proposal of the commission having charge of disarmament matters "that all nations within the League agree not to spend more in the years 1922 and 1923 in preparation for war than they will spend in 1921." This resolution was made in the form of a recommendation from the Committee to the Council.

The next development, which scored a point for the League, in the opinion of Democratic papers, was the announcement of the Secretary of

the Navy that "if the United States is not to enter into any agreement with the other powers of the earth which are now bound together in the League of Nations," he "would feel compelled to approve . . . another three-year building program." Viscount Ishii, Japan's delegate to Geneva, thereupon announced that Japan cannot reduce her armaments "as long as the United States is increasing hers." A sort of deadlock on the disarmament question then descended upon League deliberations. The Chicago *Evening Post*, however, reminds Japan that she "has nothing to fear from American armament, unless she challenges it by a direct attack upon American rights." Continues *The Post*:

"The situation might be stated in other terms. It might be said that the United States cannot modify her present armament policy as long as Japan maintains a menacing attitude toward the open door in the Orient and hints at a possible *casus belli* in our treatment of the immigration problem."

"But it is idle for the world to talk of disarmament so long as the United States sets a pace like this in naval construction," declares the Newark *Evening News*, and the New York *Globe* admits that "Japan must prepare to defend herself if we seem to be preparing to attack." "The German Navy is destroyed, therefore the great American Navy can only exist as against one of two powers—Great Britain or Japan," adds the Newark paper. And we read on:

"We have no great fundamental difference in principle at issue with either of these powers. There is no question between us which cannot be settled by discussion and which can only be met by force. Commercially, if these nations are our rivals they are also among our best customers."

"Viscount Ishii is fair. We are more of a menace to Japan than Japan can be to us. If they are in danger, the Japanese must meet it as adequately as they can. Japan cannot stop increasing her navy until we do. As with ourselves, the sea is her first line of defence."

"Secretary Daniels advertised what our situation was when he divided the fleet, placing one-half on the Atlantic and the other half on the Pacific. That was rotten strategy in a military sense, but a little more conspicuous advertisement of the fruits of our drift than placing them both together at Panama, which amounts to the same thing. His new navy estimates are further advertisement."

"Viscount Ishii speaks with reason. He not only spoke to the Assembly, he spoke to America. If we insist upon going the way we are headed, the blame for what happens will be largely our own. We are sowing the fruit that our children must reap."

In other words, asserts the Baltimore *Sun*, "we must choose between a peace policy and a war policy. To cry 'Peace, Peace,' and at the same time to propose another period of mighty naval construction must arouse suspicion and tend to postpone indefinitely the beginning of any real international cooperation on the subject of disarmament." "The way to disarm is to disarm," crisply notes the Pittsburgh *Gazette Times*. General Bliss, in making his proposals, admits that "they do not guarantee against war"; that he knows of nothing that will. But, he adds, "they will have a tendency to deter any nation from undertaking international war." Continues the General in his speech before the Philadelphia *Public Ledger* forum:

"We are saying to the world, 'We do not wish to join in any formal association with you because we fear it will not make for our peace, but war.' They are saying to us, 'We want you because without you there can be no continued peace.' Why should not the United States say to the nations: 'We will take you at your word and will test it to decide its worth. Will you, the nations that accept the preamble to the military peace terms with Germany, sign this further document with us?'"

"We will agree with you that each nation that so desires shall keep and build whatever frontier and coast fortifications it wishes. Fortifications cannot stride across the earth, devastating fields and destroying cities."

"We will agree with you that each nation may maintain its navy. No navy without an army can conquer and hold foreign territory.

"We will agree with you on a date when we shall simultaneously abolish any military system which is solely necessary for international war.

"We will agree with you on a date, as remote as the existing conditions make absolutely necessary, when we shall begin the gradual reduction of our armed forces until they are at the limit necessary for the maintenance of internal order.

"We will agree with you on the proper amounts of material to be kept on hand for the reduced forces. And we will further agree with you to cease the manufacture of material until the amounts now on hand are reduced to what we agree upon as necessary for the reduced forces."

"If all armaments could be abolished to-morrow there would still be an annual interest bill of at least \$9,000,000,000 to be paid by the belligerent nations on the debts incurred in the last war alone. If these armaments are to be maintained you must note that the military and naval expenditures of the great powers for the year 1913 amounted in round numbers to \$2,300,000,000. The economic loss due to withdrawal from productive industry could then have been assessed at \$1,000,000,000. That meant a total annual loss due to the mere maintenance of military establishments of \$3,300,000,000.

"To maintain these same establishments now will cost approximately double that sum, or near \$7,000,000,000. Nor does this take into account the accumulation of military material of expensive types in far greater quantities than have been deemed necessary heretofore. So we have staring us in the face a total annual bill of about \$16,000,000,000, and this only for a very small number of nations, for many others are staggering under lesser similar burdens which are all that they can bear."

"The maintenance of huge military establishments is a crushing burden," asserts the *Syracuse Herald*, and "the outlay for our army and navy is one of the main excuses for a program of taxation which will call for \$4,000,000,000 during the fiscal year 1921-22." And "out of every dollar of the federal government's money 93 cents is spent on wars past or to come," we are reminded by the *Springfield Republican*; "civilization is still being bled white by military and naval expenditure." "Relief from this cost, even for a limited period, say until the debts of the war are paid in part, would ease the burden greatly," points out the *Chicago Evening Post*, and the *New York Evening Post* assures us that "disappointments in the Treaty, resentments among the defeated nations, fears among the victors—all would melt into the background before a concrete gesture against increasing armaments." Granting all this to be true, what is to be done? We read in the *New York Globe*:

"If disarmament program is to mean anything it must be worked out and accepted in advance by a committee representing all the members of the League. This method might lead to the cessation of competitive arming within the League. But there is another danger to be considered. The League must at all times be at least as strong as any possible combination of nations outside the League. Just now it must calculate cold-bloodedly upon being able to resist a combination of the United States, Germany, and Russia. Such a combination is absurdly improbable, but the League must take it into account as an engineer takes into account a strain several times as great as is ever likely to fall upon his bridge or building."

Acting upon a rumor that Great Britain and Japan were to seek an agreement with the United States limiting their respective naval-building programs, Senator Borah, a vigorous opponent of the League of Nations, offered a resolution in the Senate requesting the President to seek an agreement with those powers for a "five-year naval-building truce, with construction programs cut in half during that period." Secretary Daniels opposes such a procedure on the ground that "it would make for suspicion among other nations," but the *New York Times* declares that "Senator

Borah's resolution deserves the most serious consideration." The New York *Evening Post*, recalling that the League was considering disarmament at the time the Senator offered his resolution, believes these circumstances only "enhance the impressiveness of the suggestion," because it shows that "men who are poles apart upon the question of a general reorganization of international relations are at one in their views as to the menace of huge and growing armaments."

But the Washington *Herald* reminds us that—

"Economically desirable and inevitable as disarmament is, it will not prevent wars. War-prevention can come only as do other reforms, through drawing nations together in constantly better mutual understanding; through the settlement of differences by agreement, arbitration, and court action; through building up a repugnance to war with the spirit of international righteousness."—*The Literary Digest*, Dec. 25, 1920.

WHY WRANGEL FELL.—The downfall of General Wrangel, regrettable though it was, caused no surprise in well-informed quarters, where it was well known that, despite his personal abilities and honesty of purpose, he suffered from most of the handicaps that proved the ruin of Koltchak, Denikin, and Judenitch. In one respect he was much worse off. They at least had an abundance of munitions and supplies furnished by the Allies, and if they made no better use of these than they did, the blame rested upon them and those around them. But from the very first Wrangel was short of the necessary uniforms, guns, rifles, ammunition, and other stores. Notwithstanding that the French sent him what they could, he was never able to arm and clothe more than a small proportion of the men who were nominally available for service; and although in the course of his skilfully-conducted campaign, from June onwards, he captured a large quantity of Bolshevik equipment, it was not enough to make good his deficiencies in war material. It would appear that, while considerable portions of his army fought well and put up a strong resistance against the Red onslaught, large bodies of his troops either lost heart or deliberately let the enemy through. In many ways the experiences of Denikin and Koltchak were repeated, and it may be said in general that Wrangel succumbed not to the superior fighting qualities of the Bolsheviks, who except for a few picked Communist battalions, are beneath contempt, but to their overwhelming numbers—they had 28 divisions against his five—and to dissension within his own camp. The Poles will now have to face the consequences of their refusal to co-operate with Wrangel against the common enemy. It is notorious that the vigorous offensive opened by him at the time of the great Bolshevik thrust at Warsaw was in no small measure responsible for the salvation of Poland. When the Riga negotiations were in progress Wrangel sent his chief of staff to Warsaw to try to induce the Poles to unite with the South Russians and Ukrainians in a joint campaign. But, with a woeful lack of provision that is likely to cost her dear, Poland declined.—*The Naval and Military Record*, Nov. 24, 1920.

INTERNATIONAL CABLE SITUATION.—The International Communications Conference now in session at Washington has directed public attention to this country's dependence on foreign nations for over-seas cable services. More than half of the cables now in use are controlled by Great Britain and its widespread cable system is one of the important factors contributing to the success of the United Kingdom in foreign trade. Speedy telegraphic service across the oceans is to-day essential to the transaction of the world's business and war time events have led to a far more extensive use of cable facilities than ever before. Thus the single span of cable connecting the United States with the Philippines, China, India and Japan has to take care of about ten times as large a traffic as in 1913.

Under the reparations section of the Treaty of Versailles, Germany has been compelled to renounce all interest in the 23,000 miles of cables owned by German companies before the war. How these shall be distributed is one

of the matters to be determined by the International Communications Conference. Their neutralization and being placed impartially at the service of all nations does not appear to have been thought of. On the contrary, England, France and Japan are reported to be bent on retaining the German lines in the North Atlantic and Pacific diverted by them during the war, while the United States feels that these former German cables would form a most welcome adjunct to the American cable system. If no satisfactory allotment of these ex-enemy cables can be arrived at, our government will probably be forced to lay an extensive system of its own so as to obtain direct communications free of all censorship with the principal trading nations of Europe, South America and Asia.

In the present stage of the world's progress, the nation that lacks an adequate cable system is greatly handicapped in its efforts to push its trade. Its commercial travellers are dependent on cable facilities controlled by business rivals, while its ships can communicate with their home ports only to the extent allowed by foreign-owned agencies. There is a widespread and to a certain extent justified belief that telegraphic and cable communications are used nowadays for propaganda purposes and not for the dissemination of authentic news. Recently the Rome press was bemoaning the fact that the French Havas agency, which had an interest naturally to depict happenings in Italy in accordance with French interests, was attending to the distribution of Italian news in the Scandinavian countries, Belgium and Germany. As has been well said, without quick, reliable communication, independent of other national interests, the vast sums we have invested in our merchant marine and in our organizations for foreign trade will never yield full returns.—*The Nautical Gazette*, Dec. 18, 1920.

MEXICO'S FUTURE.—General Obregon's election to the presidency of Mexico may furnish the starting point for better relations between that country and the United States. It is reported that it was a fair, square election—the first since the early days of the Diaz régime.

We are inclined to be optimistic, but our hopes have been so shattered on the rocks of internal dissension and revolution in Mexico that our optimism has clearly defined the limits that cannot be overstepped.

General Obregon knows the United States much better than any of his predecessors in office. It will be remembered that he visited this country during the World War and was taken on a tour of inspection of our great military camps and munition factories. He saw with his own eyes the extensive preparations that we were making for the prosecution of the war to a successful conclusion. He returned to Mexico an earnest advocate of peace between Mexico and the United States. He must realize that Mexico's recovery depends, in a large measure, upon the restoration and maintenance of amicable relations with the United States. This is a simple matter. The United States merely demands reasonable respect for the rights and property of its citizens in Mexico. We have no evil designs on Mexico. All we want is a square deal.

General Obregon's motto is said to be "We want less war and more work." In a signed article for the *Mexican Review* he outlines his program as follows:

After satisfying our internal needs we will attack the foreign debt. The principle will be paid in full as it comes due, of course, if we can possibly pay; otherwise we will make arrangements for extension which will satisfy our creditors.

When that is done we will talk about borrowing more money for the rehabilitation of our railroads and the building of our ports and other public works which have been allowed to go to pieces.

Whatever money we borrow will be devoted to public works only. That guaranty I will personally give. Not one penny of borrowed money will be spent for the current expenses of the government.

Our army will be cut in two. It will be reduced to one-half its present size, or 50,000 men, and will be well paid, clothed, equipped, and modernized. The 50,000 men retired will be aided to go to work on farms. We are now trying to discharge men in regions where work is plentiful and well paid. These men will remain in the service, subject to call.

I shall propose to congress that the generals be paid a lump sum in lieu of retirement pay that will enable them to buy homes or go into business and increase production. I shall try to reduce the number of clerks in government employ, too, and do away with sinecures.

Obregon's opportunity is at hand. No Mexican ruler since Diaz has faced such a favorable prospect. If he will take advantage of the situation and play the game, the success of his administration is assured.—*The U. S. Infantry Journal*, December, 1920.

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* These articles are kept on file and will be loaned to members upon application.

NOTES ON INTERNATIONAL AFFAIRS FROM DECEMBER 10 TO JANUARY 10 .

PREPARED BY

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GERMANY AND THE PEACE TREATY

REPARATIONS CONFERENCE AT BRUSSELS.—The second financial conference between Allied and German representatives to discuss reparation problems met at Brussels during the third week in December. At this meeting the German delegates requested a credit of 3 billion gold marks for purchase of food, and of an additional 3 billion marks for purchase of raw materials. They insisted that Germany's ability to pay depended on her economic rehabilitation, and that she must be regarded as an essential and integral part of the economic system of Europe. The next meeting of the conference, scheduled for January 10, was afterward postponed until January 25 or later.

EXTENSION OF SPA COAL AGREEMENT.—At the close of the year 1920 Germany was only 500,000 tons in arrears in coal deliveries under the Spa agreement providing for the delivery of 2,000,000 tons a month to France. France insisted that deliveries on this scale, in spite of German protests, should continue through the present year, without the cash payment allowed in 1920.

ALLEGED VIOLATION OF DISARMAMENT TERMS.—In a note dated December 31 the Council of Allied Ambassadors in Paris called Germany to task for failure to carry out the disarmament provisions of the Versailles Treaty and the Spa modifications thereof, requiring the reduction of the regular army to 100,000 men and of the police organizations to a pre-war basis.

According to reports of Marshal Foch and of General Nollet, Allied Military Commissioner in Berlin, the regular army had been thus reduced; but the *Einwohnerwehr* or Home Guards of Bavaria and East Prussia (Anti-Communist and frontier defense bodies) were in effect military organizations and under military rather than police control. Furthermore, it was asserted that German firms had secretly manufactured and exported aviation materials and munitions.

Germany's replies of January 3 and 5 declared in effect that Germany had loyally executed the disarmament terms except in certain points where exact fulfillment was impossible. As for German defense organizations, these were not a part of the regular army, were essential to the preservation of internal order, and would be abolished as soon as circumstances permitted.

AMERICAN REPRESENTATIVE INVITED.—Early in January France sent to the United States Government a copy of the Disarmament Note of December 31 and invited American representation at the Conference of Allied Premiers on this subject and on reparations, scheduled to meet in Paris on January 19. The French Government, it is understood, gave assurances that it did not contemplate hasty or individual action against Germany.

The attitude of the American Government, as surmised in press despatches, was unfavorable toward aggressive action against Germany, and especially toward any policy on the part of France looking toward seizure of the Ruhr valley or permanent occupation of the Rhine provinces. It was felt that fulfillment of her agreements on the part of Germany might be enforced by less violent means, such as clear indication to her that reparation terms would depend on loyal execution of disarmament terms.

GERMAN RHINE CRAFT ALLOTTED.—On January 8, Walker D. Hines, arbitrator in the distribution of German inland shipping under the Peace Treaty, awarded to France $13\frac{1}{2}$ per cent, or a total of 253,000 tons, of Germany's Rhine fleet, their value to be deducted from the sum total of reparations due France. This award was justified by Mr. Hines on the ground that France, by the return of Alsace, had become again a Rhine state. Further distribution of the German river fleet to other Allied powers, as reparation for war losses, will follow later.

It was also announced early in January that France and Brazil had reached an agreement regarding the disposition of former German vessels interned in Brazil. These vessels will be evaluated, and whether sold or not will be credited against Germany's debt to Brazil, the surplus value to be turned over to the Reparations Commission.

LEAGUE OF NATIONS

NEW MEMBERS.—On December 15 the League of Nations Assembly at Geneva elected Austria to membership in the League. Bulgaria, Finland, Luxembourg, and Costa Rica were also admitted later, bringing the total membership to 46 states. In place of Greece as one of the four nations selected by the League Assembly for representation on the League Council, China was chosen, as the result of a vigorous campaign on the part of the Chinese delegate, Wellington Koo. The states represented in the Council are now Great Britain, France, Italy Japan, Spain, Brazil, Belgium, and China.

REVIEW OF WORK OF LEAGUE ASSEMBLY.—Geneva, Dec. 20.—Two conclusions may be drawn from the work of the first Assembly of the League of Nations, which has just closed here. They may seem paradoxical, but they are not.

The first conclusion is that there must be important changes in the covenant if the League is to succeed. The second conclusion is that it is this League or none for many years to come.

It is commonly accepted by all the delegates that the United States will not enter the League at all unless alterations are made in the covenant, and there is no doubt that almost any changes which America might ask would be agreed to. Article X, or any other particular article would be thrown

overboard. The matter of the votes of the British colonies appears to offer the greatest difficulty in reference to what has been talked of as the United States' demands.

Entirely apart from securing the adhesion of America, the experience of the first Assembly has shown that the League will never get any real cohesion until the covenant is changed to give some actual power to the Assembly. There is no matter of real importance within the constructive program of the League which is not now in the hands of the Council. The covenant confers upon this body the specific right to act on enforcing Article X., or on applying Article XVI., or laying down mandate terms, or ruling on amendments. One has only to read the covenant to see that the Council receives the most important duties.

The Council is controlled by Great Britain, France, Japan and Italy, with Belgium. In other words, it is the Allied powers' machine. What it can do was illustrated at Geneva when the big powers, through the Council, refused to let the Assembly even discuss the mandate terms, and, although the Assembly passed resolutions about those terms, A. J. Balfour, on behalf of the Council, stated from the rostrum that the Council would not consider itself bound in the slightest by anything the Assembly did in this respect.

The Assembly had three constructive measures of importance before it—disarmament, the world court and mandates. On all three the big powers had their way against the overwhelming majority of the Assembly delegations.

I am not going into the merits of whether or not this has brought the best results, but the point is to be made that the League will never have the sincere co-operation of all its members so long as four of them really run the whole performance, as is the case at present.—*N. Y. Times*, December 21, 1920.

PLANS FOR WORLD COURT.—By the first of January 22 nations, or more than the majority necessary for its establishment, had signed the convention for the formation of an International Court of Justice, and four nations had agreed to submit to compulsory jurisdiction. The court, which will be formed as soon as these nations have ratified their signatures, will consist of 11 judges, and will be permanently in session at The Hague.

INTERNATIONAL CREDITS COMMISSION.—As one of its most genuinely constructive measures, the League Assembly on December 14 decided to establish a Commission by means of which nations might negotiate loans without direct application to foreign powers. A nation desiring to borrow may notify this Commission of the assets it is willing to pledge—customs, railroads, etc.—and the Commission will set a valuation and authorize the nation to issue bonds to that amount. Then the nation or its business houses may use these bonds in payment of purchases abroad. It is provided that in case the nation defaults payment of the bonds, the Commission shall take over and administer the concessions pledged as security. While apparently involving the League of Nations in the business of bolstering up international credits, the scheme at least opens a way for the resumption of international exchange.

GREAT BRITAIN

EFFORTS FOR IRISH CONCILIATION.—Following the passage of the Home Rule Bill in December, renewed efforts were made by the British Govern-

ment to confer and come to terms with responsible leaders of the Irish Republican Party. Early in January President Eamonn de Valera of the Sinn Fein Republic returned to Ireland. It was reported that he had received an offer to confer with the British Premier in London, and that definite negotiations were actually under way. The unalterable British conditions were stated to be that Ireland should not leave the Empire and that Ulster should be accorded separate control.

LORD READING FOR VICEROY OF INDIA.—Lord Reading on January 6 conferred with Premier Lloyd George regarding the offer made to him of appointment as Viceroy of India. By the British press Lord Reading was regarded as peculiarly fitted to cope with the difficult situation in India, which calls for the putting into effect of more liberal governmental machinery and facing at the same time an organized insurrection against British rule.

TRADE WITH RUSSIA.—On January 8, Leonid Krassin, Soviet Trade Commissioner in London, left for Russia with a trade agreement approved by Sir Robert Horn, President of the British Board of Trade. This agreement is likely to be rejected by the Soviet Government on account of the political conditions attached, which require that the Soviet Government refrain from propagandist or other activities in India, Persia, and the Near East. M. Krassin expected to return in about a month's time either to conclude the compact or to end the negotiations.

ITALY

D'ANNUNZIO EVACUATES FIUME.—In the latter part of December regular Italian military forces under General Caviglia, with the co-operation of naval vessels, began to close in on d'Annunzio and his legionaries occupying Fiume. Zara on the Dalmatian coast surrendered to Italian Government troops on December 26. On December 31, after some fighting and bloodshed, a protocol was signed providing that the poet and his followers should leave Fiume within five days. Following d'Annunzio's exit, the head of the Provisional Government at Fiume, Dr. Antonio Grossich, fixed February 28 as the date for the election of a Constituent Assembly. Fiume will now become an independent state, in accordance with the terms of the Treaty of Rapallo between Italy and Jugoslavia.

GREECE

CONSTANTINE PROMISES REFORMS.—King Constantine was welcomed with celebrations upon his return to Athens on December 19. At the opening of the newly elected Assembly on January 5 the King read a message in which he advocated various constitutional changes, including the establishment of a Senate as a second parliamentary body. The King reiterated that the government would adopt aggressive military measures for the control of her new provinces under the Treaty of Sevres, and would endeavor to secure the friendship of Serbia, Rumania, and the Allied Powers.

ARMENIA

WILSON MEDIATION DELAYED.—On December 16 President Wilson notified the League of Nations Council that he had appointed Henry Morgenthau, former U. S. Ambassador to Turkey, as his special representative in the proposed mediation between the Turkish Nationalists and Armenia. At the same time he requested "advice from the Council as to the avenues through which his proffer could be conveyed and the parties with whom his representative should get in contact, as well as assurances that he may count upon the moral and diplomatic support of the principal powers represented on the Council of the League."

On December 26 a telegram was received from the Council requesting information regarding the steps the President would attempt to pursue. In view of Armenia's enforced acceptance of a Soviet form of government and peace with Russia and Kemal Pasha, and in view also of the conflicting interests of the Allied powers in Asia Minor, there appeared little immediate prospect of further action in her aid.

UNITED STATES

RUSSIAN ENVOY DEPORTED.—On January 3 Ludwig C. A. Martens, so-called Soviet Ambassador to the United States, surrendered himself to the United States Department of Labor, as a result of the United States Court decision that he should be sent back to Russia. This decision was based on Martens' status as agent of the Soviet régime in Russia, the open policy of which is subversion of American institutions and government. It was announced that Martens would sail for Stockholm in the latter part of January, and that he would be accompanied by a staff of about 40.

TEMPORARY AGREEMENT OVER CABLES.—The preliminary cables conference in Washington on December 14 announced agreement on a *modus vivendi* by which between January 1 and March 15 all former German cables should continue to be operated "for the financial account of the Allied powers," income and expenses to be apportioned later in accordance with the final disposition of the cables. If final agreement were not reached by February 15, a new *modus vivendi* should be arranged. Negotiations were to continue, with opportunity for representatives to consult with their respective governments.

Press despatches indicated progress toward acceptance of the American point of view, and willingness on the part of the powers concerned that all cables, including those connected with the island of Yap in the Pacific, should be surrendered for disposal in the final settlement.

The Communications and Transit Conference under the League of Nations meets at Barcelona at the close of February.

GENERAL CROWDER SENT TO CUBA.—As a result of the disturbed financial situation in Cuba and the disputed election, General Enoch Crowder visited Havana on January 6 as special representative of the United States Government to confer with President Menocal and submit a report. General

Crowder is probably the best informed American authority on Cuba, and is author of the regulations under which the recent Cuban election was conducted.

Under the Platt Amendment to the Cuban Act of 1901, embodied in the subsequent treaty with Cuba, the United States has the right to intervene in Cuba for protection of life and property when conditions warrant such action. As a result of the November elections, Dr. Alfred Zayas, Coalition candidate, was recently elected and should take office on May 20, but there are sufficient missing or disputed votes to raise the possibility of throwing the election to General Gomez, the Liberal candidate. Two of the three previous elections in Cuba have been followed by uprisings.

A moratorium was declared in Cuba in October and later extended until February 1. Various banks have become insolvent, chiefly owing to the drop in sugar prices and difficulties of readjustment, and other banks have taken advantage of the provisions of the moratorium preventing depositors from drawing more than 12 per cent of their accounts. This leaves the sugar factories without means of financing the movement of their crops.

AMERICAN CONTROL IN SANTO DOMINGO RELAXED.—Washington, Dec. 24.—President Wilson today ordered a relaxation of American military rule in Santo Domingo as an initial step in the direction of the complete self-government of the Dominican people. For four years the United States Government has been in military occupation and control of Dominican territory and affairs, with a naval officer serving as Military Governor, having intervened in Santo Domingo in November, 1916, with the declared intention of restoring order and prosperity in that country.

In view of the substantial accomplishment of the objects for which the military occupation of Santo Domingo by the United States was undertaken, President Wilson has directed Rear Admiral Thomas Snowden, the present Military Governor of the country, to issue a proclamation announcing that the United States Government believes the time has come when it might "inaugurate the simple processes of its rapid withdrawal from the responsibilities assumed in connection with Dominican affairs."

Admiral Snowden was instructed to announce to the Dominicans in his proclamation that the formation of a commission of representative Dominicans would soon be completed. This commission will be entrusted with the formulation of amendments to the Dominican Constitution, will revise the laws of the country and frame a new election law, which, when approved by the American Military Government, will be submitted to a Dominican constitutional convention and the Congress of the Dominican Republic for approval. After that the United States will withdraw its forces from the country.—*N. Y. Times*, Dec. 25, 1920.

JAPAN

WOULD END ANGLO-JAPANESE ALLIANCE.—Tokio, Jan. 5.—The post-holiday period is witnessing a resumption by the press of the disarmament discussion, in which consideration of the Anglo-Japanese alliance plays a prominent part.

The Osaka *Asahi Shimbun* has come out in advocacy of the abolition of this alliance as a means of reaching an understanding with the United States. It argues that England's post-war policy is directed toward an understanding with America, England no longer having need of Japan as an ally, and pro-Americanism becoming the basis of her policy. The United States may not reciprocate, the newspaper comments, but nevertheless Japan, it says, should realize the futility of relying upon England. If

Japan and England desire to restrict armaments, it argues, it is essential that they eliminate the alliance, which has the effect of arousing American suspicion, and it advises the Foreign Office to reconsider its practice of pivoting its policy on that alliance.

"Let us abolish the alliance," it adds, "and then talk to America face to face, with open minds."—*Associated Press*.

AMERICAN-JAPANESE TREATY NEGOTIATIONS.—During December, in spite of the absence of Secretary of State Colby in South America, negotiations continued in Washington between Ambassador Shidehara and Roland S. Morris, United States' Ambassador to Japan, with the object of formulating an agreement which should settle the question of Japanese immigration on terms acceptable to both powers.

On December 26 it was announced that the ambassadors were ready to submit reports to their respective foreign offices, and that these reports would recommend an amendment to the existing commercial treaty by which Japanese subjects in the United States would be accorded the same civil and property rights as other aliens. Japan on her part would undertake complete prevention of emigration of Japanese labor to the United States and Hawaii, though not to the Philippines.

Such an agreement would render the recently passed California law ineffective against Japanese land ownership, but California might adopt new legislation, similar to that in British Dominions, excluding all aliens from land titles.

ALIEN OWNERSHIP OF AMERICAN OIL.—Washington, Jan. 6.—While Great Britain obtains about 80 per cent of the oil used on her merchant and naval vessels from the United States, at prices varying from \$1.80 to \$2.40 a barrel, at the same time she charges American ships \$7 to \$12 a barrel for oil in the Near East, Senator McKellar of Tennessee asserted in the Senate to-day. Senator Phelan of California added that California oil companies controlled by the British sold their oil to Californians for \$2.40 a barrel, while they sold the same oil to the Japanese for storage in Formosa at about \$1.80 a barrel.

Senator McKellar brought the oil problem to the floor in a speech in favor of the passage of his bill which demands for Americans the same rights in foreign countries that foreigners enjoy in the United States. Senator McKellar declared that there was no reciprocity in the British policy—a policy by which, he added, England was able now to conserve her own vast holdings while at the same time tapping most liberally the fast diminishing American oil supply.—*N. Y. Times*, Jan. 7, 1921.

REVIEW OF BOOKS

"Nautical Tables Latitude 30° to 60° ." By Harold Bunker, lieutenant (j. g.), U. S. Naval Reserve Force.

These tables published by Imap, Laurie, Morie and Wilson, Ltd., 156 Minories, London, in 1920 represent an effort on the part of the author to contribute to the already existing mass of tables, one which combines the required data for finding positions at sea, in the most compact and useful form possible.

They are a distinct advance over the older tables, in that they give the azimuth directly, which is especially helpful in the modern method or "New Navigation."

While the book includes all the tables required for the solution of the position problem, the principal one is "Table V" which contains the altitude and azimuth for every ten minutes of time from six hours before meridian to six hours after; marked 6.00 a. m., to 6.00 p. m., limited however, to bodies from 0° - 25° declination north or south and to positions in, from 30° - 60° north or south latitude. The latitude and declination are interchangeable of course, and the tables may be used in latitude 0° - 25° north or south for bodies whose declinations are from 30° - 60° , but this is seldom required.

In spite of the excellent arrangement of the auxiliary tables for facilitating the work, Table V requires far too much interpolation, as not only the table itself but the auxiliaries must be interpolated for accurate work, and this combined with limited application, makes this method far less useful than many others.

The amount of work required to determine the time, is of course, common to all solutions, but from this point that method is to be preferred which produces the required position with the fewest figures and the least number of operations and book openings. Owing to the arrangement of the auxiliary tables on extension leaves, the number of book openings for the Bunker's Tables is least but this is more than offset by the extensive amount of mental arithmetic required.

While under most conditions the determination of the azimuth to within one degree is sufficiently close, the use of the gyroscopic compass and the drafting machine makes a more careful determination of z very desirable, and to get this from Table V requires still further interpolation.

In commenting on these, all types of tables have been considered. Ordinary trigonometric, the haversine, the versine, Ball's, Martelli's and Aquino's. Of these Aquino's are by far "the simplest and readiest in solution" and give altitude and azimuth in adjacent columns on the same page,

for all latitudes and for declinations up to seventy degrees north or south. As the use of the latter enables the navigator to have one type of solution for all sights except meridian altitude, it is to be preferred.

For merchant navigators, however, using the North Atlantic steamer lanes and depending almost entirely on sun sights and the magnetic compass, these tables might be very useful, as shown by the fact that they would have been available for all sights, sun and stars except Vega, a total of 116 sights out of 120 on one voyage from the United States to Brest and return. They cannot however, be recommended for general navigation.

A. M. R. A.

"The Strategy on the Western Front." By Lieut. Colonel H. H. Sargent, U. S. Army.

Like the same author's "Napoleon Bonaparte's First Campaign," "The Strategy on the Western Front," by Lieut. Colonel Herbert Howland Sargent, United States Army (retired), is a rapid glance at the salient strategic features of the mightiest of modern¹ conflicts presented simply and clearly.

The broad treatment of the subject, as well as a few explanations of technical terms, such as *forming front to a flank* and the features of salients, suggests that the book is intended for the civilian rather than for the military student who would demand much more detail than is presented.

Another view, however, might be taken of the author's intentions: that he only offers the outline of a thesis that the strategy of the World War was largely faulty. In this way it is interesting for its several speculations upon the probable consequences of a different strategy.

Reverting to the supposition that the author's principal address is intended to be to the civilian, it might have been appropriate if he had included in his preliminaries a definition of *strategy* in order that the reader might understand exactly the compass of this strategic study. Many civilians, lacking military instruction, think of strategy as the application of stratagems, *i. e.*, the trickery of warfare. Even among military men there seems to be a considerable variance in the definition of strategy, if not in its concept. Our own navy regulations, for example, define it as:

"Strategy applies to the distribution of naval forces, their armament and supplies in preparation for war or in the prosecution of war. It includes logistics. It refers to naval movements and dispositions made before contact with the enemy's forces."²

An American military authority says:

"Strategy in its most general sense may be defined to be the art of directing the employment of the armed strength of a nation to best secure the objects of the war."³

¹ Asia suffered a greater war in the thirteenth century when Jenghis Khan's armies killed some thirteen millions in China and probably as many more in western Asia.

² U. S. Navy Regulations, 1913, par. I. 5354, subparagraph 5.

³ Fiebeger, "Elements of Strategy," p. 4.

Most classical writers accept Clausewitz's definition that "Strategy is the employment of the battle to gain the end of the war."⁴

According to this catholic view, the instruments of strategy are armies and fleets applied in battles or held as a threat of battle. The strategist's concern is to so plan all his fighting forces as to insure victory at the decisive point or in the decisive area, *i. e.*, where the victory will break the will of the enemy. For example, he might say, "I will make such dispositions as will tend to attract the enemy to areas "A," "B," "C" and "D" and suffer the enemy to have his victories there, in order that I may have my victory at "E"—the decisive point.

We would therefore expect "The Strategy on the Western Front" to be a discussion of where battles were fought rather than how, for the manner of the fighting is the province of *tactics*.

The author has met this expectation by discussing the offensive and defensive as alternating between the different fronts and has been tempted from that scheme rarely and then only out of apparent deference to the civilian reader, as it were, to give him full measure of information. Without groping through a forest of detail, the reader may pass in the clear light of day from one high peak of momentous military fact to another and then on to another. In the end, it is the reader's own fault if he has not what he impliedly contracted for when he read the title on the book-seller's inviting shelf.

THE THREE ERRORS

There were three great German offensives on the Western Front, we are told, in each of which Germany made a great strategical blunder: the first Marne, the Verdun campaign of 1916, and the offensive begun in March, 1918.

The first alleged error was in attempting the strategical offensive on two fronts at the same time. The Western Front, only one hundred and fifty miles long, was protected by the Moselle and Metz, backed by the Rhine and Strassburg; it could not have been turned by France without violating the neutrality of Belgium or Switzerland. Had Germany held this line defensively with a small part of her combatant forces while she defeated her other enemies in detail, the war would not have lasted more than two years. Thus the Germans would have avoided violating the neutrality of Belgium and the consequential British and American hostility.

The failure of the western offensive is attributed particularly to the strength of Belfort, which commands the narrow pass into France between the Vosges and Jura ranges. "Had the Germans been able to capture this fortress," he says, "the way would have been opened for turning the Vosges and the fortresses of Épinal, Toul and Verdun and for the envelopment of the French right wing, which, with the left wing and the little British and Belgian armies already enveloped, would no doubt have resulted in the final surrender of the French army and the capture of Paris."

⁴ Clausewitz, "On War," Bk. I, p. 85.

"This accomplished," he continues, "their next step would have been to cross the English Channel. With their submarines, aeroplanes, and Zeppelins, to protect their transports from attack in crossing, and with no army of any consequence in Great Britain at that time to repel the invaders, it seems not improbable that they would have been successful, although their losses might have been considerable. In Great Britain's poor state of preparedness at that time, and with the flower of her regular troops already destroyed in France, probably less than half a million veteran German troops would have been able to overrun the island, capture London, and conquer Great Britain.

"Then, of course, they would have taken over the British Navy; and with the French Navy already taken over, and their own navy and submarines, they probably would have provoked war with the United States and made short work of the American Navy. With it out of the way there would have been nothing to prevent their transports, loaded with their best troops, from crossing the Atlantic; and with practically no army in the United States to meet them they could easily have taken possession of a good part of the North Atlantic seaboard states, captured New York, Boston, Philadelphia, and Washington, and compelled these cities to indemnify Germany for the entire cost of the war.

"It is easy to see now that at the battle of the Marne Germany was within a hair's breadth of conquering France; and that this most probably would have speedily led to her conquering Great Britain and the United States and her domination of the world. *But Belfort stood in the way.*"

That Belfort happened to be in French possession is attributed to the statemanship and eloquence of M. Thiers. The events of the negotiation at Versailles, during the armistice of February, 1871, are reviewed, in which it is recalled that, during the armistice, the German Army was not to enter Paris. The long discussion between M. Thiers and Prince Bismark resulted in placing the option with M. Thiers of allowing the German army to enter Paris or of surrendering Belfort. Paris paid the price for the retention of Belfort. Thus, M. Thiers' eloquence and Paris' sacrifice in 1871 saved the world from German domination in 1914.

The Second Error: After the battle of the Marne Germany remained on the defensive on the Western Front for about eighteen months, during which she was considerably outnumbered by the Allies. She assumed the offensive in other parts of the theatre of war with successful campaigns against the Russians and Serbians. But before she had entirely disposed of Russia, Serbia and Italy, she again assumed the offensive in the West by way of the Crown Prince's tremendous campaign for Verdun—one of the most formidable in history—which failed. This is charged as a mistake because with the same effort and less loss Germany could "have completed her victories in the Eastern Front, destroyed the army at Salonica, and captured that important seaport; then with greatly superior forces have struck and crushed the Italian army; and then, with all her enemies disposed of outside of France and Belgium, have returned to the Western Front with an enormous preponderance of forces."

The Third Error: After the failure at Verdun the Germans again assigned the West to the defensive rôle, and resumed the offensive against Russia, Roumania, and Italy. But here again the Germans were not persistent, for if they had massed their available forces in turn against Salonica and Italy, probably both would have been disposed of, the Germans would have occupied Greece and the valley of the Po, and would have advanced to the French and Maritime Alps for an invasion of France *via* Nice.

Instead of following up her advantages in the Near East and in Italy, Germany precipitated her offense of 1918 in the West, beginning on March 21, with her powerful thrust at Amiens, followed by the attack against the British around Ypres and two attacks against the French between Reims and Montdidier towards Chateau-Thierry, in none of which attacks was she able to make a sufficiently broad rupture in the line to allow resumption of a war of movement.

These three severe judgments passed by the author of "The Strategy on the Western Front," viewed in the light of theory and fact, may not be conclusive.

Theory states that governments negotiate by means of diplomacy until the will of one government can no longer be reconciled with the will of another government, when negotiation passes from diplomatic means to the province of Force or War. Strategy then serves the government in lieu of diplomacy. Strategy expresses the will of the government which is the will of the people—always the will of the people in the last analysis, as it was in Germany.

It will be remembered that Russian mobilization and concentration proceeded much more rapidly than the German Great General Staff had anticipated and that Russian armies overran East Prussia with considerable initial success, in fact, with such tremendous success that, out of consideration for the *morale* of the German people, it became necessary to stop the Russian holocaust and the flow of refugees flying westward to spread panic in the empire. Probably nothing that happened during the World War so inspired the German people to subsequent supreme effort as the great victory of Tannenberg during the last days of August, 1914. Who can say that without that inflation of *morale* they could have sustained the struggle as they did?

Is it not true that Germany's supreme strategic advantage lay in her central position affording her *interior lines*? And if that is true, was it not correct strategy to utilize her interior lines for the movement of forces to reenforce the front that was momentarily most seriously threatened, always making her offensive objective the armed force that, at the time, threatened the most serious damage, instead of selecting any such geographical objective as Salonica, Greece or Italy?

Another consideration that insists upon place in arriving at a judgment as to whether or not German strategy erred in renewing the offensive in the West from time to time visualizes the Allies as in command of tremendous military resources which were organizing to seize a favorable opportunity to take the offensive. German strategy demanded the western

offensive, with offensive tactics, in order to hold the initiative, break up Allied consolidations and disrupt Allied offensive plans that, left to develop, would have materialized into too great a momentum for a German defensive.

These are, of course, great questions that open up almost illimitable vistas of courses that might have been pursued by either side to the conflict and invite mental excursions into the realms of "what might have been." And just as each traveller therein cannot be denied the scenes he describes in passing, he must not be allowed, on the other hand, a certain destination. At least the author of "The Strategy on the Western Front" has presented clearly and interestingly a thesis of scientific importance, for the literature of every war preserves for future use the epochal views of precedents.

In the presence of such gigantic considerations it seems trivial for the reviewer to pass to critical analyses of technical terminology. There is, however, excuse in the fact that the business of fighting is more and more coming to be a science, and with that evolution there is a rising importance in its descriptive phrases. For example, on page 52 of the book in question, in a discussion of the merits of salients, it is said of troops occupying:

"There is a great *strategical* disadvantage; first, because they have too limited a space to maneuver; and secondly, because they are subject to converging fire from the enemy occupying the counter-salients."

It would seem that the word *strategical* should be *tactical*, for the question of kinds of fire are tactical considerations.

Again, on page 54:

"It should, perhaps, be remarked here that the foregoing discussion of a salient has reference more particularly to what may be termed a *strategical* salient, . . ." whereas the discussion appears to indicate a *tactical* salient since it mentions the sensitiveness of occupying troops to converging fire as well as the sensitiveness of the communications of the salient. The Galician salient was a *strategical* element because its possession would be the issue of several battles and the possible mission of several strategic units; the Chateau-Thierry salient was *tactical* because its disposal might be determined by one battle, more or less prolonged, and by one army.

On page 49, the expression "defensive-offensive strategy" might not be clear to all readers. Offensive strategy implies the control of the initiative and usually invasion of enemy territory or adjacent seas. Defensive strategy is the reverse. How, then, can a belligerent maintain a *defensive-offensive strategy* at a given time? Some authoritative writers use the expression "The enemy was on the defensive-offensive," one part of the compound noun referring to his strategy, the other part to his tactics. Other writers say "The enemy was on the offensive defensive" (making *offensive* an adjective by the omission of the hyphen), meaning the maintenance of a more or less aggressive campaign (tactically) on strategical lines imposed by the enemy. Although this may be an elementary matter, and certainly is academic, the use of the expressions in question has given rise to much discussion, never satisfactorily determined, in war-college and service-school circles, to which it would be a boon if

someone would issue an authoritative definition, perhaps based upon good usage from a collation of military classics.

The pages presented under the caption of "Unity of Command" serve to remind the reader, possibly with the hope that those high in political authority might take note, that with all the pretensions of the superiority of modern warfare the Allies had to learn from bitter experience the lesson of central command when they might have accepted the principle as unreversed precedent definitely established in the wars of history since the Greeks ignored their law of the land to give single command at Marathon. Justification was as prompt and pronounced in the case of Foch as in the case of Grant.

The chapter about "Foch's Great Counter-Offensive" is one we like to read because it pictures our victories instead of our defeats. In every writer's account of this epoch there is a dramatic climax around the date of the passing of the initiative. "On the evening of July 17, the Allies were on the point of losing the Reims salient, a loss almost certain to bring disastrous consequences. On the evening of July 19 all had changed, the Germans were about to lose the Chateau-Thierry salient; and with it all hope of final victory." The passing of the initiative to the Allies was determined by the exhaustion of German reserve divisions.

Other interesting topics of this rather wide-range book include surprise attacks made possible by two new weapons: gas attack first appearing near Ypres April 22, 1915, and the tank at Cambrai in November, 1917. The tank was an agent of surprise because it enabled the attacking Allies to dispense with the usual elaborate artillery preparation which invariably had given notice of the approaching attack. In this connection it should be noted that the tank was not entirely a twentieth century discovery, for centuries before the Christian Era a protected machine on wheels, carrying archers within the shell as well as a ram worked by the sheltered crew, was employed in the "Two Rivers Country" to force a breach in fortified lines. This ancient weapon was quite the prototype of the modern tank, for its power, protective features, and speed were relatively as great as in the tank, when we consider the relative power of the infantry in the two epochs—the bow and arrow, supported by spearmen, *versus* the high-powered rifle supported by modern artillery. In fact, there was little in the World War that was entirely new. Apparently the modern classical scholar had his day at court in bringing to light old methods that had been buried in the mold of countless centuries of history, for the modern military utilitarian to apply to tremendously important service. Gustaphus Adolphus had also been a student of ancient history and had discovered, in the wonderfully complete Byzantine military organization, evidences of the use of a terra-cotta hand bomb which he revived with improvements as the hand-grenade which, in turn, was forgotten by many generations until revived again for the World War. Liquid fire was also a Byzantine expedient; their armies squirted burning gun-powder through tubes into the faces of the proximate enemy. The swinging bridge equipment used on the British cruiser in the Zeebrugge attack must have been suggested by some historian's revival of the story of the *corvus* used in

the battle of Ecnomus, 256 B. C., probably the greatest naval battle in all history, in point of number of ships and men engaged. It is not so remarkable that methods of fighting should develop in circles of time, as that a valuable weapon should fall into disrepute, because the defense against it seems to outstrip its offensive use, only to be revived in an improved form in later centuries. It is suggested that we should not be so fickle as to discard weapons the first time they suffer eclipse by the counter-weapon, but that we should be somewhat patient in improving the old weapon by increments to neutralize the increment of superiority of the counter-weapon.

The estimates of the comparative strength of opposing forces on the Western Front contain the following items of information:

"It is generally admitted by both sides that at the battle of the Marne the Allies considerably outnumbered the Germans.

"... of combatants actually engaged in the battle there were probably three million in all.

"... if we deduct the German forces employed in the East and those which were in the first instance kept at home for coast defense, the French, English, and Belgians possessed a numerical superiority of something like three-quarters of a million men."

After the battle of the Marne the Allied superiority increased up to September, 1915, when Frank H. Simonds estimates their numbers as:

French	2,000,000	
British	750,000	
Belgians	100,000	
Germans		1,500,000
Allied superiority		1,350,000

Colonel Sargent estimates that at the time of the attack upon Verdun the Allied superiority was "at least half a million men." He goes on to say:

"For a year and a half following the attack at Verdun, the Allies seem to have outnumbered the Germans by several hundred thousand."

On May 25, 1918, the number of combatant forces on the Western Front are said to have been as follows:

	Divisions	Battalions	Rifles	Artillery
British	50	495	520,000	6,247
French	103	964	674,000	10,103
American	5	60	65,000	458
Belgian	6	108	56,000	699
Italian	2	24	16,000	100
<hr/>				
Allied total	166	1,651	1,331,000	17,607
Enemy total ...	208	1,914	1,654,926	17,168

But this estimate takes no account of more than 600,000 other Americans then in training in France, and that by the end of August more than 500,000 Americans "were ready to take their places on the firing line." By November 1, there were nearly two million American soldiers in France. At

that time the Allied rifle strength had a superiority over the German of more than 600,000.

Discussing "Allied Victories in the East," Colonel Sargent adopts General Malleterre's view that "Whatever resistance the Germans might have been able to make in the West, their military defeat was inevitable after the victories in the Orient over the Bulgarians and Turks." He also adopts the Malleterre view "that if the expedition of the Dardanelles had succeeded in 1915, and if we had taken Constantinople, Russia would have remained a strong military factor, and the war doubtless would have finished two years ago." (This was written in April 1919.)

"The Strategy on the Western Front" will doubtless attract wide attention both here and abroad. European military students are manifesting an increasing interest in American military opinion as well as in American campaigns.

G. C. T.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,
Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- "Rebuilding the Navy's Enlisted Personnel, and Reestablishing Its Morale and Spirit After the Serious Slump Caused by too Rapid Demobilization and High Wages in Civil Life."
- "The Human Element in the Administration of Discipline."
- "A Demobilization Programme for the Future."
- "The Mission of the Naval Academy in the Molding of Character."
- "Health of Personnel in Relation to Morale."
- "Physical Factors in Efficiency."
- "The Naval Officer and the Civilian."
- "Naval Bases, Their Location, Number and Equipment."
- "Military Character."
- "The Ability to Handle Men a Necessary Element in the Equipment of a Naval Officer."
- "The Relation of Naval Communications to Naval Strategy."
- "The Relation of Naval Communications to Naval Tactics."
- "The Training of Communication Officers."
- "The Organization of a Naval Communication Service."
- "The Naval Policy of the United States."
- "A Review of the Battle of Jutland with Lessons to be Learned Therefrom."
- "Modification in the Design and Armament of Ships to Meet the New Conditions of Aerial and Subsurface Attack."
- "Coordination of Surface, Subsurface and Aerial Craft in Naval Warfare."
- "Our New Merchant Marine."
- "Submarine Warfare, Its History and Possible Development."
- "Escort and Defense of Oversea Military Expeditions."
- "A Proposed Building Programme for the U. S. Navy, Including an Efficiency Air Service."
- "Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation."
- "The Ship's Company—Its Training, Discipline and Contentment."
- "The Principles of Leadership of Naval Personnel."
- "Morale Building."
- "The Value of Facility in Exposition—Verbal and Written—for Naval Officers."
- "Discipline as Affected by the Human Relation."
- "The Value of Pep."
- "Navy Spirit—Its Value to the Service and to the Country."
- "The Influence of the Term of Enlistment on the Efficiency of the Service."
- "The Principles upon which Should be Founded the Freedom of Neutral Shipping on the High Seas."
- "The Fighting Fleet of the Future."
- "The Future of the Naval Officer's Profession."
- "The Navy: Its Past, Present and Future."
- "The Navy in Battle: Operations of Air, Surface and Underwater Craft."
- "Shall I Remain in the Navy?"
- "Psychology and Naval Efficiency."
- "The Naval Policy of the United States in the Light of the Peace Treaty."
- "Scope of Naval Industrial Activity and the Navy's Relation to Shore Industry."
- "The Pacific Theater."
- "Was Germany's Coast Impregnable?"
- "Future Development of the Naval Shore Establishment."
- "America as a Maritime Nation."
- "Arguments for and against the Restriction of the Manufacture of Munitions to Government Owned Factories."
- "The Present Rule of Neutrality regarding Contraband and Blockade—Is it Justifiable in Ethics or in Expediency?"
- "The United States Navy and the League of Nations."
- "Is a League of Nations Navy Desirable?"
- "The Adaptability of Oil Engines to all Classes of War Vessels."
- "The Place of Mines in Future Naval Warfare and the Rules under which Their Use Should be Allowed."
- "The Use and Abuse of the Doctrine of Continuous Voyage."
- "The Question of the Future Use of Submarines."

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement, of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

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CONTENTS

NAVAL AVIATION AND A UNITED AIR SERVICE. By Captain T. T. Craven, U. S. Navy.....	307
LEADERSHIP. By Commander R. C. Parker, U. S. Navy.....	323
NEW WINE IN OLD BOTTLES. By Captain J. S. Taylor (M. C.), U. S. Navy	331
SOME SOUND PHENOMENA CONNECTED WITH GUN-FIRE. By Commander Garrett L. Schuyler, U. S. Navy.....	345
THE SOUL OF THE SERVICE. By Captain E. P. Jessop, U. S. Navy....	351
A PRACTICAL TEST OF RADIO COMPASS SHORE STATIONS. By Lieutenant Harold O'D. Hunter, U. S. Navy.....	363
THE TWELFTH REGIMENT (PUBLIC WORKS) AT GREAT LAKES. By Commander Walter H. Allen (C. E. C.), U. S. Navy.....	367
THE ORIGIN OF GROG. By Colonel G. C. Thorpe, U. S. M. C.....	377
THE MYSTERY OF THE LINE OF BEARING. By Rear Admiral G. H. Burrage, U. S. Navy.....	379
DISCUSSION	393
SECRETARY'S NOTES	397
ANNUAL FINANCIAL STATEMENT.....	399
PROFESSIONAL NOTES	405
NOTES ON INTERNATIONAL AFFAIRS.....	447
REVIEW OF BOOKS.....	457
INFORMATION INDEX	398

NOTICE

ANNAPOLIS, MD., February 14, 1921.

The Board of Control, having carefully read the essays published in the PROCEEDINGS during the year 1920, have the honor to announce that, in accordance with Article XI of the Constitution, the prize for the year 1921 is awarded to the essay "Accuracy of Fire at Long Ranges," by Captain J. V. Chase, U. S. N.

Honorable Mention is accorded to the following essays:

"A Description of the Battle of Jutland," by Lieut. Commander H. H. Frost, U. S. N.

"Possibilities of a Trans-Pacific Flight," by Commander G. C. Westervelt (C. C.), U. S. N., and H. B. Sanford.

W. T. CLUVERIUS,

Captain, U. S. Navy.

A. BRONSON,

Captain, U. S. Navy.

T. L. JOHNSON,

Captain, U. S. Navy.

E. J. KING,

Captain, U. S. Navy.

W. G. DuBOSE,

Captain (C. C.), U. S. Navy.

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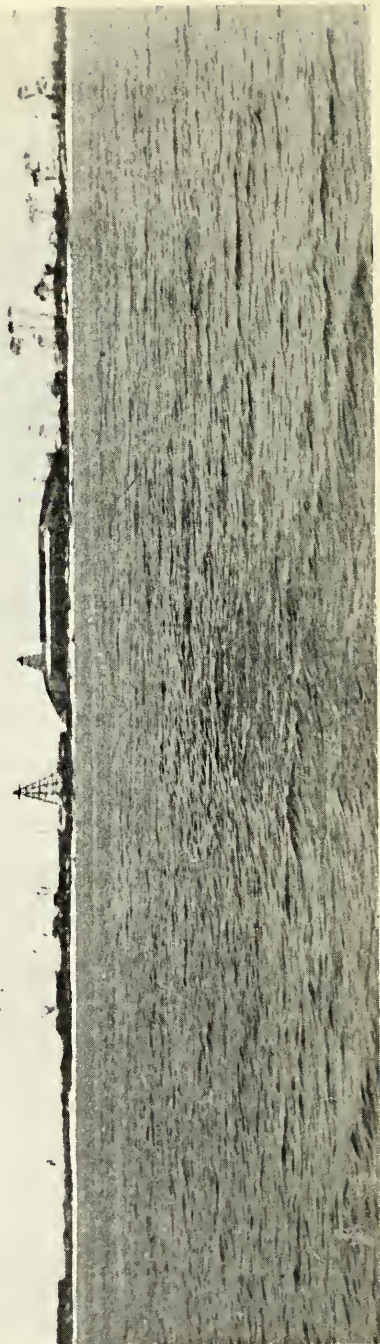
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NAVAL SEAPLANE DROPPING TORPEDO.

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NAVAL AVIATION AND A UNITED AIR SERVICE

By CAPTAIN T. T. CRAVEN, U. S. Navy

The prime factor in the problem of lessening the likelihood of wars is the democratization of governments, assisted through improvement in communications and transportation, and the community of world-wide commercial and industrial interests. Allied with this important factor is another dealing with the terrific expense of modern warfare and the serious interference with business incidental to the mobilization of national resources. A third deterrent is the augmented frightfulness of conflict and the stupendous physical damages wrought through the application of modern arms.

The important influence of each of these factors is well understood, and though to-day we find man willing to admit that wars are to be less frequent in the future than has been the case in the past, statesmen retain the view that the likelihood of resort to arms remains of more than mere contingent interest.

If the recurrence of war is conceded as a possibility, protection of the persons and of the interests of citizens remains a most important and also unavoidable public business of a commonwealth. All world powers retain disinclination to jeopardize national safety while anxiously considering the possibilities of reduction of armament and diligently seeking a means for diminishing the expenses of insurance against the ravages of invasion, for those who have

had experience in battle are in accord that future conflicts will be far more destructive to life and to property than any which have taken place in the past.

In our study of the subject of national defense, we will find it clearly set forth that countries with far-flung overseas possessions and wide commercial interests have never rested secure behind immobile coastal fortifications, and that now, far easier than ever before, business paralysis and national bankruptcy may be precipitated by agents never sighted from the shores of the state assailed. Historically it can be shown that, when outlying territory and the overseas commerce of a nation have not been afforded adequate naval protection, such interests in time have passed automatically into the hands of other countries better appreciating the value of naval power.

While it is entirely reasonable to presume that through the continued progress of science our present ideas of sea warfare and of sea strategy may be completely revolutionized, and that ultimately the influences of aeronautics upon the destiny of nations may become far-reaching, there is no replacement at present for sea power, which continues to supply the sole means for protecting outlying possessions and for ensuring the security of waterborne trade. Questions as to types of vessels and of arms best adapted for naval purposes and concerning the tactical employment of ships have supplied topics for discussion for hundreds of years, but from the earliest times, large, powerful units have constituted the backbone of naval strength, and as yet no substitute has appeared for the capital ship, the infantry of the sea, as the nucleus around which to construct the fleet. It is short-sighted, however, to base ideas of a naval war upon conceptions of what may be but a single and a remote phase of the conflict, such as a classic fleet engagement between battleships, without proper consideration of the tedious though important operations of maintaining forces in the theaters of activity, efforts which, perhaps, have led up to the conflict between the major units or had an exceedingly important bearing upon the issues of the campaign. The variety and numbers of fighting units necessary are dependent upon the strength of the enemy, the composition of his forces, and the circumstances in which the antagonists are placed.

To measure the power of a navy by the strength of its battleships alone is heresy. Furthermore, the investment of the thirty

odd million dollars necessary for the commissioning of a single battle unit is an insurance proposition which does not to-day appeal particularly to the tax-payers anywhere in the world. Everywhere the desire exists to find a substitute for huge and expensive naval hulls which are far too valuable to risk upon the coasts of the enemy, and all seek the means to augment the effectiveness of naval force through other agents.

Generally speaking, naval force must have eyes to discover the foe; tentacles capable of searching out and cutting arteries of communication, of crushing his outer members, of holding him, and of applying the pressure that assists in the strangulation of his main body. Battle cruisers, light cruisers, destroyer leaders, destroyers, submarines, mine layers, aircraft carriers, and aircraft are indispensable. They are the arms and the eyes of the fleet and are just as requisite for the conduct of operations afloat as are artillery, tanks, chemical warfare service, aircraft, and other auxiliaries as assistants to the infantry arm in present-day land warfare.

Bases near the scene of conflict are requisite. Such positions furnish indispensable links in the chain of naval defenses which must be suspended from these centers. Assailing an aggressive adversary scientifically prepared for war, without having bases from which to project one's effort, would court disaster. It should be borne in mind, however, that though the present has given stupendous force to the great variety of military arms, mere position, without mobility and the power to act aggressively, is almost valueless. A base does not constitute strength, it simply affords a point from which strength may be applied. Unless offensive acts which seriously affect the enemy can be projected from a base, and it is used to further these operations, such a point may become a serious source of anxiety instead of an asset to the home land in the event of war.

Aviation is now a powerful supplement to sea power, through which the might of the mobile naval arm may be greatly increased. This supplement is potent in that it furnishes a means for obtaining information, now a detail of supreme importance, and it is also an agent for applying violence to the territory of the foe. A fleet no longer may withdraw from the seas and safely await its opportunity to strike, for aviation nullifies the security formerly supplied by sheltering harbors protected by coastal forti-

fications in which the side choosing the defensive could formerly seek refuge. Aviation vastly augments the difficulties and the hazards of conducting naval operations upon the coast of an enemy supplied with an aeronautical arm. Consequently, it is a strong weapon of naval defense as well as of offense.

The adaptation of aviation to naval work along these lines was begun during the first years of the recent struggle, but did not, by any means, reach the advanced stage attained by military aeronautics, and the suppression of the submarine has been considered as the major effort of the naval sky-men during the World's War. In the historical narratives now appearing, we see the importance which the naval leaders attached to the control of the air, and from these articles we are beginning to get direct evidence of other important results accomplished by naval aeronautics. From them also we glean opinions based on proved experience concerning the organization of the naval aviation arm, and the way in which it may be applied. It has been clearly demonstrated that aviation is an indispensable adjunct to the navy, but in our research we will discover that, while past achievements are wonderfully suggestive as to the possibilities of the future, there remains a tremendous field yet open for development and experimentation in flying operations over water. Indeed, one may say that even the type of machines best adapted for distant overseas work from ships as bases remains undecided, and that the naval flier is still basing his tactical plans upon the perfect performance of apparatus as yet undesigned. It is probable that this condition will continue to obtain for some time, and the best that can be done immediately is to provide the means permitting the widest investigation and experimentation in the development of naval flying equipment and accessories. It is needless to state that it is important to attack the uncertainties of experimentation and design directly. Those responsible for carrying on tactical operations alone can judge of military requirements rightly, and the designer must work closely and progressively with the operator, and, in order to be able to supply his demands, be familiar with the peculiar conditions in which the latter is employed.

The sailor has always had a technique of his own which, to the landsman, has been somewhat of a mystery oftentimes engulfed in sea sickness, and the navy alone is competent to work out a solution to the problem now in hand. The situation, however, is

complicated because of the wide exercise of imagination on the part of many individuals who, keenly interested in flying and familiar with the performance of aviation over land, display ignorance of the sea and of naval requirements. Frequently items are printed regarding aviation which carry naval construction and naval engineering far beyond the development of the arts as they may be practiced at the present time.

Publicity is the most powerful lever man has at his disposal for directing progress. Sustaining the interest of the public by means of publicity is essential, but care should be taken that statements set forth should not be exaggerated. Exaggerated statements that may momentarily strongly appeal to the popular imagination have really little lasting influence, and are not soundly beneficial. Extravagant claims unfulfilled always breed public distrust.

There has been much discussion in the press concerning the basic organization for naval aeronautics, of grave importance to those concerned with that arm and to the people who have regard for public interests, for upon this vital point depends the speed, the economy, and the efficiency of future progress.

During the recent war with an actively aggressive enemy within easy flying range, the air forces of Great Britain were merged into a single organization, and British naval aviation, as such, disappeared. The amalgamation, devised to relieve a peculiar situation, was advocated by the strong army flying corps whose existing organization would be only slightly disturbed by joining the forces. It was endorsed by the press and by politicians, and was effected despite the objections of the naval contingent. At the time, it seemed to those who were interested particularly in the naval aspect, that coordination became difficult, and that an indiscretion had been committed, though it was imperative to meet directly the conditions that the enemy had imposed upon England and her allies. The opinion of opponents of the measure was based on the idea that circumstances might well be entirely different in future conflicts, particularly where adversaries were far distant from one another, and that it must seem evident that anything that might diminish the coordinated flexibility of organization, and the mobility so essential for the far-reaching naval machine, was fundamentally undesirable.

For a nation the home territory of which is not immediately exposed to dangers of invasion but nevertheless having wide-flung national interests at stake, the issue is of peculiar importance, and it is of particular interest now for us again to view the situation in Great Britain, as suggestion has been made that we organize our defenses along British lines.

An important historical lesson which cannot fail to impress itself upon the minds of all students is the effect of tradition and of service ties upon service thought. In reading, one notes the many failures of amphibious enterprises, undertaken jointly by troops and sailors, due directly to mutual misunderstandings. One cannot fail to observe how frequently a sacrifice of public interest has been made at the altar of personal prestige. Despite the difficulty of coordinating the work and interest of the army and the navy, and though the importance of concentrating human effort, and of eliminating confusion in the conduct of present-day warlike operations is vastly enhanced by the speed with which tremendous force may be exerted, England has assumed the task of coordinating three separate arms.

The Air Service and the British Fleet are together working for the solution of the problems made common to both, and the presence of airplane carriers, special ships arranged particularly for the conveyance of aircraft, has facilitated this task. We know that every effort is being made to ensure harmony in the work of the two organizations embarked in a single ship; nevertheless, rumor has it that all is not plain sailing, and it is evident that the old problem of overcoming human friction continues to be the one giving gravest concern. It remains to be seen how satisfactorily the arrangements advocated by the Admiralty will work out.

The following extract from the statement of the First Lord, explanatory of the Navy Estimates, 1920-1921, indicates the present opinion of British naval authorities:

So far as can be foreseen, naval requirements will be met by the proposal ultimately to form a naval wing under the Air Ministry, with a personnel specially trained for naval work.

To assist in the development of this naval wing, it is proposed to detail officers volunteering for air work to the Air Service for training and for subsequent service in the naval wing. Such officers as are specially fitted for work in the higher ranks of the Air Service will, by arrangement with

the Air Ministry, be permitted to continue in the Air Force, but the majority of officers after their term of service in the Air Force will return to the Naval Service and continue their naval duties. Thus in the course of a few years there will be a body of naval officers who will have had experience in the Air Service, who will be equipped with knowledge regarding air matters, and who will be able to keep the navy as a whole fully up to date in regard to air strategy and air tactics in relation to sea power.

This would seem to be a compromise essential and desirable in view of the principles underlying the organization of the Royal Air Force.

Wide complications have been introduced because through the medium of the air, military and naval forces to-day are brought into much closer contact than ever before, and at times their operations must overlap. In coastal operations particularly there is possibility of misunderstanding which may lead to inadvertence in a national emergency.

In the effort to avoid conflict of authority and confusion in matters of coast defense, the Admiralty have represented to the Air Council that in their opinion:

(a) The operations of all aircraft flown from H. M. ships and vessels with whatever object in view, that is to say, not only reconnaissance and artillery observation machines, but also machines which are carrying out operations in the air for offensive and defensive purposes; and

(b) All operations carried out by aircraft not flown from ships, but which are being carried out in connection with the command of the sea, that is to say, operations for oversea reconnaissance and for the attack of enemy ships and vessels—

should be under naval control. Dual control would be unworkable. In all matters relating to the command of the sea the Admiralty are and remain the responsible authority.

The propriety of these arrangements must be evident to those who concede to the navy domination in overseas activities.

When the day comes, and perhaps it may, that supremacy in the air controls, then all air forces should and must be united. For the present the strongest argument that may be advanced in favor of a united air service is that such an organization centralizes authority and ensures for aviation strong backing and support, without which progress may be slow in the development of the art now that the artificial stimulation incident to war has been removed. An allied argument is that though such a plan would take away from the army and the navy the aeronautical branches rightly belonging to them, in the past, the army and the navy have

been loath to accept aeronautics. In considering the broad question as to the advisability of a combined air force, too much stress cannot be laid upon the conviction that while perhaps those who are or have been interested in the army aeronautical branch may consider the occasion timely for an amalgamation, the navy holds a contrary opinion, which is shared by our highest military authorities. Vast experience in practically every phase of army aeronautics has been obtained, and the value of the land reconnaissance machine, scout, fighter, and bomber clearly demonstrated under war conditions. Desperate competition for air supremacy on the Western front in Europe was responsible for the rapid development of army aviation, but no such field of activity was open to naval aviation, and little real war experience was obtained with fleet spotting and reconnaissance machines, torpedo planes, or aircraft operating with the fleet and flown from the decks of ships.

The landsman cannot appreciate the difficulties confronting the sailor in the application of his arms, or the fact that in using weapons the sailor has a task entirely different from that given his brother on shore. The failure to understand this fundamental is to a considerable degree responsible for the views which we hear expressed frequently with regard to the desirability of a United Air Service. It is not appreciated possibly that a flier accustomed to work with the army and over the land, unfamiliar with the tactical employment of ships and with the sea, would be of as little assistance in carrying on naval work as would be a soldier, untrained in naval matters, on board a surface or sub-surface vessel in time of action.

A gun installed on land, on a steady platform, which does not move, which cannot sink, and which may be concealed and strongly protected, is far simpler to operate effectively than is a similar weapon conveyed in a ship. According to an old French saying, "One gun on the land is worth ten guns on the sea." The problem of ordnance and of gunnery, as it is presented to the two services, to some degree exemplifies many other difficulties inherently belonging respectively to the army and to the navy.

The assailing of land bases by the navy has always been fraught with many complications. Such is destined forever to remain the case. Every weapon which the navy can use in such operations can be better employed by its opponents from the shore. This

will be true of the flying sailor in the future as it has been true in the past of mariners who did not fly.

The aviation service which the navy desires now, and which it must have, is an arm which will assist it to defeat the enemy



NAVAL SEAPLANE DROPPING BOMBS.

at sea. This is its paramount present-day essential. In so far as this detail is concerned, and regardless of future developments, the matter is purely a naval one which the navy alone can handle.

The development of the land plane and of aviation tactics over the land in conjunction with troops has progressed far beyond the uncertain stage of experimentation. In the combined service

which has been developed in England, the preponderance of experience, of skill and technical talent, and of numbers, rests with the branch composed of those who have won their laurels in connection with overland operations. The development of naval aviation has been slow for two reasons: first, because Great Britain has two services in the same ship occupied with a common problem. It is not difficult to understand why progress has been impeded as a result of this arrangement. A second obstacle has been that incidental to the attempt to compromise and to adapt land types, an attempt has been made to improvise machines for ship's use rather than to attack directly the problem of obtaining suitable apparatus for overseas work. There are certain characteristics which must be embodied in machines to be used from ships, which may be enumerated as follows:

(a) Flotation, which provides reasonable safety for the pilot and for the machine.

Unless flotation is supplied which insures reasonable safety, the development of the tactics, the materials, or the general knowledge of aviation for naval purposes will not proceed, for the commander-in-chief and the commanding officers of vessels employing aircraft will not wish to hazard unduly aviation personnel in conducting exercises, in time of peace, necessary for studying and developing the tactical employment of this arm. Interest in the application of aviation in so far as the navy is concerned cannot be obtained unless this characteristic is given to naval plans. An effort to compromise the land type of plane by fitting it with flotation for work over water is a valuable experiment but so far it has been insufficient for naval requirements.

A second quality essential for naval planes is:

(b) Ruggedness and dependability, capable of being taken down and assembled easily and quickly and when taken down, capable of compact stowage.

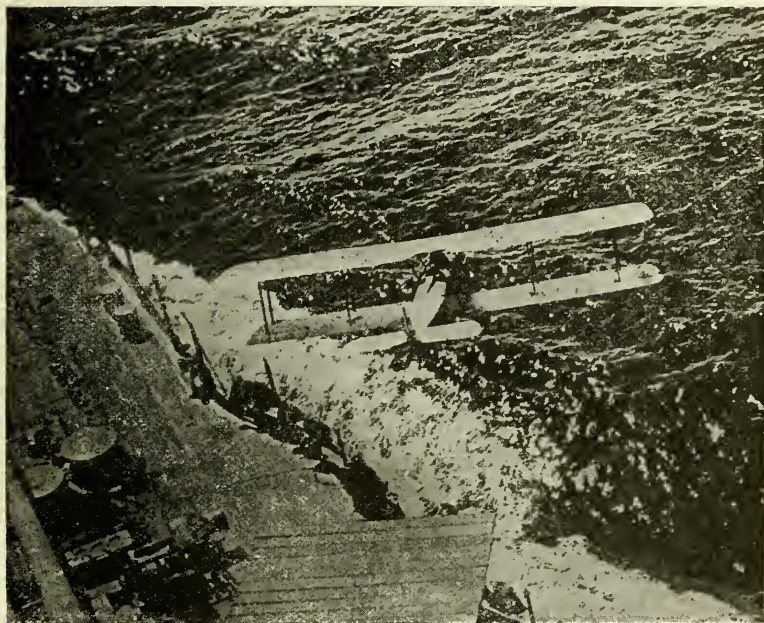
The inconvenience incidental to carrying and attempting to operate planes from the decks or turrets of ships adds one more mental burden to the great load already carried in times of peace by the captain of a naval unit. The present types of planes when conveyed on decks or turrets are very much in the way and one cannot expect to find airplanes in general use on shipboard until machines have appeared which can be taken down easily and stowed inboard out of the weather and in a fashion which does

not interfere with ship activities. Features which embody ruggedness and permit the quick taking down and assembly of planes are of far greater importance to the navy than to the army.

A third attribute to be incorporated in a naval plane is:

(c) Ability to fly from a vessel, either directly or assisted, and to land on the deck of a ship or in the water.

In order that planes may be carried in different types of vessel, it is essential that they may get away from the deck of the ship



NAVAL AIRPLANE FLYING FROM A SHIP AT SEA.

with a very short run or that they may be projected into the air from a machine such as a catapult. It is self-evident that a naval plane must be fitted to land on a deck or on the water. The land flier is not concerned with these details.

A fourth essential attribute for a naval plane for ship's use is:

(d) Low landing speed.

It can be readily seen that the closer the speed of the plane approaches the speed of the plane carrier—the ship upon which she desires to land—the easier a landing becomes upon the deck of such a vessel. A plane with an excessively high landing speed

cannot land upon the deck of a carrier with any degree of safety. The importance of low landing speed is supreme for planes to be conveyed in ships of the carrier type.

It is evident that these four characteristics cannot be secured without sacrifice, to some degree, of the high performances now given to the plane of purely a land type, but the navy must accept this penalty in the aviation arm as it does in the application of all weapons conveyed in surface and subsurface vessels.

Having determined the four characteristics enumerated as essentials, we then have a fifth which must be included in order that the machine carried by a ship may serve a useful end. The plane must be:

(e) Capable of conveying and of usefully applying military power.

This implies good vision, maneuverability, speed, and climb, also ability to carry and to utilize an armament of guns, bombs, or torpedoes.

If one considers the five characteristics enumerated above and has knowledge of the conditions of the art as it exists to-day, it becomes evident that the solution of the naval problem has been retarded by the processes of standardization, that have inadvertently developed in the past, of types of planes for the two services.

The proposition to combine the production of machines for the army and the navy therefore is seen to be illogical and could only result in further delaying the naval unit in its effort to acquire the apparatus which will permit aviation definitely to take the place belonging to it in naval affairs.

In all scientific research, centralization is fatal, and in chemistry, biology, and physics, the advancement of human knowledge has come from the independent and competitive efforts of men scattered all over the world, yet working on the same problem. In this way, false deductions are disproved and useful suggestions are carried further and confirmed. In aviation, experimentation and development, if centralized, would in the course of time become controlled by the strongest influence in the central organization, which would produce a series of official designs incorporating the virtues and prejudices of the bureaucracy. The highly developed automobile has come directly from the competitive efforts of countless minds engaged in scientifically investigating

and solving the many problems involved in its production. The aviation art is comparable to the automobile industry in the transition stage and requires the widest investigation and development.

Military and naval aviation are for the grim but definite purpose of waging war. Civil aviation has an entirely different end. To military, naval, and civil aviation are presented concrete and entirely different problems, each susceptible of independent solution. The creation of an independent and united service, necessitating a new branch of the government carrying a great and uneconomical overhead, does not supply an organization fitted for the work now in hand. With the establishment of a means through which development of military and naval aeronautics may be insured directly through agencies belonging to these services, and civil interests cared for and promoted by other methods, all good reasons for the building up of a united air service disappear.

A sailor must be skeptical as to the success of ventures undertaken far from home bases by a united air service or by other services where naval interests are paramount but control divided. That doubts exist in England with regard to the success of the British plan is evident from the statement made by Admiral Jellicoe in his book, "The Crisis of the Naval War."

On page 256 of that publication we read the following:

In the matter of organization we must be certain that adequate means are taken to ensure that the different arms which must cooperate in war are trained to work together under peace conditions. A modern fleet consists of different types—battleships, battle-cruisers, light cruisers, destroyers and submarines. Before I relinquished the command of the Grand Fleet, large sea-going submarines of high speed, vessels of the K class, had been built to accompany the surface vessels to sea. It is very essential that senior officers should have every opportunity of studying tactical schemes in which various classes of ships and kinds of weapons are employed. In considering the future of the navy it is impossible to ignore aircraft. There are many important problems which the navy and the air service ought to work out together. A fleet without aircraft will be a fleet without eyes, and aircraft will, moreover, be necessary, not only for reconnaissance work, but for gun-spotting, as well as, possibly, for submarine hunting. Air power is regarded by many officers of wide practical experience as an essential complement to sea power, whatever future the airship and aeroplane may have for independent action. A captain who is going to fight his ship successfully must have practiced in time of peace with all the weapons he will employ in action, and he must have absolute control over all the elements constituting the fighting power of his ship. In a larger sense, the same may be said of an admiral in command of a

fleet; divided control may mean disaster. The advent of aircraft has introduced new and, at present, only partially explored problems into naval warfare, and officers commanding naval forces will require frequent opportunities of studying them. They must be worked out with naval vessels and aircraft acting in close association. With the air service under separate control, financially as well as in an executive and administrative sense, is it certain that the Admiralty will be able to obtain machines and the personnel in the necessary numbers to carry out all the experimental and training work that is essential for efficiency in action? Is it also beyond doubt that unity of command at sea, which is essential to victory, will be preserved? In view of all the possibilities which the future holds now that the airship and aeroplane have arrived, it is well that there should be no doubt on such matters, for inefficiency might in conceivable circumstances spell defeat.

The following extract from Field Marshal Sir Douglas Haig's final report, while not touching directly upon the basic organization of the air service, indicates the importance of close cooperation between aviation and land troops:

It should never be forgotten, however, that weapons of this character are incapable of effective independent action. They do not in themselves possess the power to obtain a decision, their real function being to assist the infantry to get to grips with their opponents. To place in them a reliance out of proportion to their real utility; to imagine, for example, that tanks and airplanes can take the place of infantry and artillery, would be to do a disservice to those who have the future of these new weapons most at heart by robbing them of the power to use them to their best effect.

Every mechanical device so far produced is dependent for its most effective use upon the closest possible association with other arms, and in particular with infantry and artillery. Airplanes must rely upon infantry to prevent the enemy from overrunning their airdromes, and, despite their increasing range and versatility of action, are clearly incapable in themselves of bringing about a decision. Tanks require the closest artillery support to enable them to reach their objectives without falling victims to the enemy's artillery, and are dependent upon the infantry to hold the position they have won.

As an instance of the interdependence of artillery and tanks, we may take the actions fought east of Amiens on August 8, 1918, and following days. A very large number of tanks were employed in these operations, and they carried out their tasks in the most brilliant manner. Yet a scrutiny of the artillery ammunition returns for this period discloses the fact that in no action of similar dimensions had the expenditure of ammunition been so great.

Immense as the influence of mechanical devices may be, they cannot decide a campaign. Their true rôle is that of assisting the infantryman, which they have done in a most admirable manner. They cannot replace

him. Only by the rifle and bayonet of the infantryman can the decisive victory be won.

On January 12 of last year General Pershing expressed himself as follows, regarding a united air service:

Military forces can never be efficiently trained nor operated without an air force.

An air force, acting independently, can of its own account, neither win a war at the present time, nor, so far as we can tell, at any time in the future.

An air force by itself cannot obtain a decision against forces on the ground.

A military air force is an essential combat branch and should form an integral part of the army.

If success is to be expected, the military air force must be controlled in the same way, understand the same discipline and act in accordance with the army command under precisely the same condition as other combat arms.

An air force, as well as all other branches of the military organization must fully understand its exact functions in working with other branches, must know the needs of other branches, be in full sympathy with them, think in the same military atmosphere, and have the same *esprit de corps* in order that effective battle control may be established.

No such force can realize the above conditions unless it be an integral part of the command not only during battle but also during the entire period of doctrinal training.

To realize these conditions the different arms of the service must live together and train together.

An air force should be established as a separate arm of the service, coordinate with the infantry, cavalry and artillery.

An air force should not be established as a combatant force distinct from the army and navy.

In view of the definite opinions publicly expressed by leaders in the great struggle of the recent past, it is obvious that advocates of a united air service, if acquainted with actual conditions and requirements, are basing their arguments in favor of such an organization on other than military grounds.

DISCUSSION

REAR ADMIRAL BRADLEY A. FISKE, U. S. Navy.—Captain Craven's article seems so moderate, complete, convincing and sound, that no way of discussing it occurs to me, except that of paraphrasing what he says. I cannot forego the opportunity, however, of declaring my admiration for it.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LEADERSHIP

By COMMANDER R. C. PARKER, U. S. Navy

FOREWORD

It is extremely gratifying to me, personally, that in response to the offer of a prize for the best essay on "Leadership," open to the officers and men of the Atlantic Fleet, excluding only the commissioned personnel of my staff, so excellent a treatment of the subject should now be available to the navy.

It was my object in offering the prize to obtain material for a handbook on "Leadership" for the use of officers, with particular reference to a naval officer's qualifications for the Leadership of enlisted men. But I wished also to encourage thought along these lines throughout the fleet's personnel and to this end invited the enlisted men to compete.

Both objects, I feel, have been attained, the one in the generous response to the prize offer and the interest taken in the contest by officers and men alike, the other in the text of this essay, so simply and so convincingly phrased that few indeed of those who start reading it will fail to finish it and a majority will keep it by them for future reference.

I don't wish to seem to attach too great importance to the benefit to be derived from a mere discussion of "Leadership." The example of, and training by, experienced officers is the only school in which real Leadership can be learned and often a post graduate course of hard years of experience must be added. But I have believed, and this essay confirms me in the belief, that if certain essential requirements embracing the best ideas of the service were clearly set forth in a handbook available to all officers, this training would be more easily and quickly accomplished to the good of the service.

The vital importance of personnel in the navy of to-day, and in the navy of the future, requires Leadership of the highest type. The thoughts expressed by Commander Parker will unquestionably help in the development of such Leadership. For this reason I sincerely hope that every officer and petty officer in the navy will not only read what he has to say but reread it and refer to it from time to time to keep the cardinal points he makes, fresh in his memory.

The publication of the essay in this convenient form makes this easy.

H. B. WILSON,
Admiral, U. S. Navy.

U. S. S. *Pennsylvania*, Flagship,
November 5, 1920.

LEADERSHIP

The following brief article has little enough to do with Leadership as a general subject. It would be difficult to conceive of a single thought, principle or viewpoint that has not already been enunciated by various able writers, ancient and modern; and what we might conceive to be our own originality on the subject would probably be merely our ignorance of what some wiser man had expounded yesterday—or a thousand years ago.

To the earnest student of the Art of Leadership there are always available three wide sources on which to draw.

First, the many excellent books and articles that have been written on the very subject; second, the lives and precepts of the really great leaders of all ages; and third, but not least, a clear recollection of those men under whom we have ourselves served, who by their methods and character succeeded in drawing from us the very best we had to give in loyalty, obedience and efficiency.

I think this last is perhaps greatest of all, being nothing more than a practical application of the Golden Rule—to deal wisely with others by imitating those who dealt wisely with us.

Never, I think, in the history of our navy has Leadership been so necessary a quality for the young officer as to-day. The general feeling of unrest throughout the world, the shaking of faith in old beliefs and in the established order of things, the spirit, not exactly of Bolshevism but of discontent with our own position and rewards, all are reflected more or less among us in the naval service.

The end of the war brought with it a most pronounced "let down" in morale, which, however distasteful to the disciplinarian, is at least not surprising to the psychologist. Human emotions are bound to move more or less in cycles. For every peak there is a corresponding valley; and the stimulus of war which stirred to a high pitch the qualities of enthusiasm, loyalty and sense of duty, did, unfortunately, like other stimulants, leave behind it a period of depression.

If I should advance the proposition that peace-time demands a higher quality of Leadership than war-time, it would probably be ridiculed as contrary to all established ideas. Yet, within certain limits, it is absolutely true.

Ask any of the men who held commands afloat in the war-zone and they will tell you that in many ways their work was made easy for them. Tremendous was the responsibility, but at the same time danger, excitement, patriotism all combined to foster an alertness and morale which gave the superior a confidence in the subordinate such as has seldom been enjoyed under more settled conditions. Eyes that are searching for the feather of a periscope or wake of a torpedo are not likely to become drowsy, nor is discipline hard to enforce when destruction may be the price paid for the lack of it. More than that, the common danger and the greatness of the cause developed almost automatically a mutual loyalty between officers and men which is not come by so easily when these factors are removed.

Yet the exercise of all our finer qualities in time of war is not enough. History is replete with instances where nations as well as individuals gave all that they possessed of leadership, patriotism, heroism and industry toward the prosecution of a war, and yet went down to defeat, simply because they *had* reserved them for war and not applied them to the fullest extent in time of peace. Wherefore those of us, young or old, who still cherish a few ideals concerning the service and intend to stick by it, must spur ourselves with the realization that the best we possess of Leadership should not await the call of some vague tomorrow, but is needed now, to-day, more desperately against the forces tending to lower our morale than against any enemy we are liable to encounter.

American officers have a more difficult task to handle and standard of Leadership to maintain than the officers of any other nationality. The very superior mentality of our men imposes this.

However much of a hero the European conscript may have proven himself to be, he has not the education or assertiveness to be intensely analytical of his superiors. Hundreds of years of the feudal and military systems have ingrained in him a respect for the officer caste and a ready belief in its superiority. The proper relationship between officer and man exists almost automatically.

But in the case of an American officer and his men, when first brought into contact, there is no existing relationship whatsoever, and it requires to be established from the very beginning.

And the problem is no simple one. For the ordinary American boy, on first enlisting, has not the faintest conception of discipline or military duty nor of the respect and obedience due to his superiors in rank.

How should he have, who never before heard of rank? Does he learn it at home? In the public schools? Is it something we have a right to expect of him like common honesty and morality?

Most certainly not.

The obvious fact is that this initial ignorance of his relationship to his officers is a perfectly normal condition and one which should never be allowed to cause a rise in blood-pressure on our part. And the work of establishing the relationship is as clearly part of an officer's routine duty as standing watch or caring for his battery.

Let us pause a moment, then, and look from the viewpoint of the recruit in the rear rank, seeing his division officers for the first time.

What impression do you make in his eyes, Mr. Junior-Officer?

Does he see you lolling and indifferent?

Careless or "non-reg" in your dress?

Diffident and apparently afraid of your own voice?

Blustering and brow-beating?

Giving orders in a "won't you please" manner?

Excitable and inclined to throw fits over trifles?

Or does he see you a proper figure of a man, self-confident, firm, courteous, military; and conveying the impression of being in command, not so much by the stripes on the sleeve of your uniform as by *virtue of the Man inside of it*?

Continuing the acquaintance, does he find you an active force whose presence helps the work along, or is it "Bo'sun's Mate, take charge?"

Do you so throw yourself into all branches of work that you kindle a like enthusiasm in him?

When the sun is hottest, or the rain has turned the coal dust to mud, are you there in the middle of it, encouraging?

Do you correct his mistakes consistently and thoroughly, or apparently just when the mood strikes you?

When he transgresses the law do you deal with him in such fashion that he realizes why he was wrong and should henceforth

do better, or do you merely give the impression of having worked off a fit of temper?

Does he feel that being in the same division, same ship and same service with yourself is a bond between you, or a barrier?

If in trouble or needing help or advice, are you the first man he would turn to, or the last?

Are you a true leader in the sense that your *influence and example make men give freely of their best efforts*, or are you a sort of human lemon-squeezer that by dint of much pressure extracts a little sour obedience?

All these questions it were well to ask yourself before looking in the mirror with too much satisfaction and asking permission to go ashore!

Have faith in your men!

I do not believe that any officer who habitually mistrusted or looked down upon his men ever yet achieved success as a leader. Picton at Waterloo may have led his troops to the charge with the words, "Come on, you damned thieves and pick-pockets," but I will venture to say he *smiled* when he said it, and *led*, not *drove* them.

Too often nowadays one finds a young officer sitting in the wardroom and growling about the short-comings of the enlisted personnel he has to deal with.

Are they lazy? *Be you industrious.*

Are they dirty and unmilitary? *See to it that you are above reproach yourself.*

Is their morale low? *Then for shame's sake, stop whining, get up there and show them what a man should be!*

STUDY THEM, WORK WITH THEM, GUIDE THEM; report whom you must and commend whom you can, but whatever you do, *never lose faith*, for when that happens, it is not they who are hopeless but you who are beaten.

If you are well born and brought up, with a background of family, and your government has spent four years educating you, and gives you rank and position in the world, what is it all for, if not that *you may have something to give in character* to those whose start in life was less fortunate?

And rest assured that teaching even one hopeless specimen to hold up his head and take a man's pride in himself, is THE GRANDEST WORK AN OFFICER CAN DO—better than writing fifty articles

on "Leadership" or on "The Higher Ethics of the Fire and Bilge Pump."

The MAN is the thing, not the machine or the idea or the regulation. We are too prone to work for results alone without considering that the *real* problem is the MAN on whom we should depend to get those results.

As a humble example:

Suppose our first sailing launch, under care of Bill Jones, coxswain, has continually fallen below the required standard of cleanliness.

Now, our primary mission and objective should be, not the sailing-launch, but Bill Jones himself.

By heckling and driving we may finally get the boat fixed up for inspection—and thereby have accomplished a little.

But if we are able to get Bill Jones himself fixed up, to get him to take a pride and intelligent interest in his boat, then we have accomplished as much *and a great deal more*. For not only is the boat now clean, but Bill Jones has become an *asset* instead of a liability, and THE SEED THUS SOWN TENDS TO MULTIPLY ITSELF.

Farther back than this, the same principle holds good.

You yourself bear much the same relationship to Bill Jones that he does to the boat. Get *yourself* fixed up; get yourself in the proper relationship to your men; *make yourself a true Leader*; and all the Bill Joneses and sub-Bill Joneses and their boats will in due course fall into line, and the whole lump be leavened.

If something is wrong, set it to rights by all means, but do not stop there.

Why was it wrong? Did some human element of the system fail?

Then repair *him*. Reprimand him or encourage him; teach him or court-martial him; retain him or get rid of him; handle him in whatever best way heaven gives you wisdom to do, *but don't leave him to muddle along unrepaired*.

And when you are through with him, then go back one step farther and ask yourself, "What was wrong with *me*, that *he* should have been wrong?"

There is an expression current among salesmen, I believe, to "sell" a man, meaning to convince him that their line of goods is the best and is what he needs.

The man who desires to exercise true leadership must "sell" himself to his men in the same way, to the extent of carrying to them the conviction that he *is* the man best fitted to command.

Were we always engaged in battle or emergencies it would be comparatively simple, but failing that, the leader must identify himself as such by certain invariable characteristics.

ABILITY

The young officer, at least, should be able to do everything that he requires others to do, and do it better, no matter how small the detail or humble the task. When the men find that you *are* right even in small things, they will have faith in you for the bigger things.

LOYALTY

There is loyalty "down" as well as loyalty "up," and one cannot exist without the other. As you feel toward your men, so will they feel toward you. Give, and unto you it shall be given.

TACT

It is the lubricating oil of human relationships. The man who considers tact unnecessary in dealing with subordinates is probably the same man who hammers his sextant with a monkey wrench to make it work!

JUSTICE

It is not enough to think yourself that you are just and fair; make your men think so, too. You do not demean yourself by explaining the why and wherefore of an order or decision. A sense of injustice will kill spirit and morale quicker than any other agency.

COURAGE

We know you have it; but take heed that never by the slightest accident or error your men get the idea that there is any danger you would not undergo or hardship you would not share with them. If ever you lose your nerve before them, pack your trunk and get transferred quickly.

TRUTH

Tell them what you, when you can. Neither conceal nor exaggerate nor minimize. Keep your word whether it be to give a

promotion or a court-martial. Better never to make a promise than ever to break one.

FIRMNESS AND CONSISTENCY

Be firm as a rock when right, but never obstinate. If wrong, admit it, and you will gain rather than lose in prestige. Finish what you start. Never give up. Never blow hot and cold according to circumstances, but invariably live up to the same principles.

The foregoing are a few, a very few, of the points which no officer can neglect. Ceaseless study and constant effort are none too much. For in the final analysis, *he who has mastered the Art of Leadership has mastered everything, since through others, all other arts are subject to him!*

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NEW WINE IN OLD BOTTLES

By CAPTAIN J. S. TAYLOR (M. C.), U. S. Navy

We are credibly informed that in the remote past a community of diminutive rodents was annoyed and decimated by the frequent inroads of a certain predatory feline. In council assembled it was decided that the wisest procedure would be to fasten to the grimalkin's neck a tintinnabulator of some sort by which warning of his approach would unfailingly be given to his contemplated victims in time to permit their escape. The question next presenting itself and one for which no solution could be agreed on was: "Who will bell the cat?"

There is very general agreement in the United States Navy that it is desirable and proper to give precedence to the best man and that merit should be the basis of promotion, but a great many of us do not believe in the present system of promotion which is not necessarily based on merit just because it is officially declared to be so based. Likewise, however strongly we may, as individuals, hold to certain opinions, we are probably agreed that in the past few years under the system now in vogue some men of conspicuous merit have been promoted along with others of less conspicuous merit, while some men have been passed over or have failed of promotion who, in the opinion of at least a respectable minority and probably in the opinion of the majority of service men, not members of the board, had merit equalling or surpassing that of the persons selected. If we are united in a love for the service that is something more than a liking and taste for it and includes a consuming desire to see it become an increasingly efficient instrument for the purpose intended, and if, in consequence of that love, we are able and willing to consider with fairness and liberality important phases of its administration, we cannot decline to admit that serious discrepancies of honest opinion regarding

the correctness and justice with which merit is determined demand careful scrutiny of the system of selection. The fundamental practical fact to be established in discussing the present system is not whether merit should be the basis of promotion, but *how* merit is to be determined and to what extent it *can* be determined by the system in vogue or by any other system. The scheme of belling the cat was an admirable one but it failed from being impossible of execution.

The first, because the most self-evident and incontestable, objection to the scheme of promotion by merit was that it involved a breach of contract. The system was imposed on men who had entered the service and served for periods varying from 5 to 25 years or more on a very distinct understanding, affirmed by statute and intrenched in the precedent and practice of military establishments the world over for centuries, that their promotion would be determined by seniority, subject to examination to determine physical, moral and professional qualifications. We entered the service on this basis and regulated our lives in matters of health and conduct and professional attainments so as to conform to prevalent standards in these particulars in order, when death, resignation or retirement created a vacancy, to qualify by record and examination for the next higher rank. Suddenly all this was changed and a new system of promotion was put into effect with the consequence that many men who had modelled their life upon and were fully up to existing requirements could not meet the new one, though not necessarily through lack of merit of one kind or another. It would have been perfectly permissible to announce that after a certain date all persons entering the service, or that, beginning 5 or 10 years from the date of enactment, all persons then in the service, would have their relative merit and standing determined by a new method.

Before discussing further valid objections to promotion by selection (to call it promotion by merit is the special pleader's favorite device of calmly assuming as proved the very subject under discussion) it is pertinent to consider the old plan of promotion by seniority. Here, too, it is possible to be specious, to employ the *argumentum ad hominem*, to make subtle pleas which appear to appeal to judgment but really invoke prejudice and rest on prejudiced and preconceived ideas. "What!" says the civilian, who as a civilian is inferentially free from the jealousy, the ani-

mosity, the narrowmindedness of the military man, "you believe in promoting a man because he is old!" The legitimate answer is that, subject to considerations of health, integrity and mental attainments, experience of military affairs is essential. This is the great but concealed reef where so many well formed plans of comity between military and civilian come to grief. It is the common opinion among the non-military that any brave man can be a good general: that if to courage we add the possession of a yacht or the ability to take a ship alongside a dock or to navigate ships across the ocean we have all the qualities going to make a good admiral. We refer the curious on this point, if such there be, to the introduction to Colonel Henderson's life and campaigns of Stonewall Jackson and to a study of all the written and unwritten history of amateur commanders and proceed, merely noting that the practical working of the system of selection permits though it does not compel an utter disregard of the qualification for promotion known as experience.

The old system of promotion by seniority theoretically considered was ideal, just as any plan is ideal which, like it or the one now substituted for the old one, pretends to promote men strictly on merit. Let it be understood that the old or seniority system aimed just as high as its successor and let it not be assumed for a moment by its opponents that it was devised without such safeguards as the intelligence and patriotism of the time could suggest. On the occurrence of a vacancy the officer with most experience was tested as to his fitness to succeed the late incumbent. He appeared before boards of officers who endeavored to determine his physical, moral and professional title to promotion—boards of officers under a solemn oath to decide upon his merit without partiality or prejudice. In theory this was promotion by merit. Except that it gave a certain preponderance of weight to experience, it did not essentially and materially differ from the intention of the plan now in operation.

In practice, promotion by seniority was not an unqualified success. The "plucking board" was established to make good the deficiencies of seniority promotion. The plucking board annually removed from the active list a certain number of officers whom it adjudged among the less meritorious officers of the service. It did not remove them *all* or at least it had no statutory power to remove them all because the number to be plucked each year was

fixed. The ostensible advantage of the plucking board was that it increased the flow of promotion by creating vacancies through the elimination of "dead wood" at the top of certain specified grades. The examining boards should have done this and would have done it if the needs of the service and the individual had been more broadly considered by the lawmakers. The operations of the plucking board were not wholly satisfactory or at least did not give unquestioned and general satisfaction because all the weaker vessels were not invariably consigned to the "back channel" and because, from time to time, a man would be plucked who had been regarded by a goodly number of his professional associates as a good man. It is perfectly clear that had promotion by seniority worked properly it would have eliminated the men actually left to be eliminated by the plucking board and would have made the latter less necessary. (We say less necessary instead of unnecessary because a man could be plucked who was not immediately due for promotion and so might otherwise wait years before a vacancy above him brought him to trial before the examining boards.)

If promotion by seniority was a satisfactory arrangement why did it create dissatisfaction in any circles? The answer lies in part in the frailties and weaknesses of human nature and in part in a frank lack of recognition of one essential feature of seniority promotion which has never been provided for. The examining boards should be supplemented by another board which might be called the Assignment or Classification Board (*vide infra*).

By the frailties and imperfections of human nature we mean an unconscious, an unintentional partiality combined with error of judgment on the part of those honestly attempting to do their duty and very far from any purpose or willingness to violate the oath taken as members of the examining board. There is undoubtedly a strong disinclination on the part of an examining board to adopt an aggressive policy of elimination not called for by law. To reject an officer for promotion or to disqualify him for the service after he has served for many years with zeal and faithfulness because of temperamental defects undeveloped or unperceived at the time of his admission to the service, defects which time, trials, disappointments and perhaps injustice have accentuated, is not a grateful task, especially if he has lovable qualities, is in many ways meritorious and above all is recognized as a man.

of high integrity and worthy purpose and considerable ability. Let us take a concrete example. An officer who has done well as navigator, ordnance officer, first lieutenant or even as the executive officer, comes at last to command rank. His technical knowledge of his profession, his enthusiasm for it, his loyalty, courage and patriotism are beyond question, and yet as the captain of a ship he proves to be by no means an unqualified success. Long years of subordination to military authority may have so warped or dwarfed his field of vision that he has become a martinet misinterpreting the purpose of discipline or unable to maintain it in its broadest and most useful conception as an agency for expression and expansion instead of for repression. Again he may be lacking in the inherent qualities that make for successful handling of men. Or he may have developed an excess of caution and regard for technical checks on initiative which amounts eventually to timidity in execution. This candidate is sound physically and upright morally, and he is so highly developed mentally that he has no difficulty in putting on paper brilliant answers to the professional questions propounded. The defects noted above are recognized by the individual examiners but they have no written or official evidence before them of these defects. They are matters of personal opinion and the board may not be unanimous in recognizing them. In view of all the positive accomplishment and the high moral standing, combined perhaps with great personal charm, of the candidate, he is promoted, the board taking the position that his deficiencies in one particular are abundantly offset by positive merits in another and that there are many posts of importance in the naval service which he can fill with success and advantage to it besides the one duty of command (*e. g.*, Naval Observatory, Navy Department, War College, Naval Academy, service as attaché, etc.). The board balances the pros and cons and considers the good outweighed by the bad. The judgment of the board may be in error, for human judgment is fallacious and honest intentions in candidate and in examiners are no guaranty of infallibility. Happily the consequences of error are not always serious. Men develop as well as deteriorate. Many a commander who made a failure with his first ship becomes in time a very successful one, just as some who are remarkably successful at first disintegrate later and become the source of regret and dismay to the boards that promoted them or to the authority that assigned them

to duty of paramount importance. On the other hand boards frequently recommend the promotion of an officer whose case was made the subject of earnest discussion because of very definite grounds for mistrusting his abilities and under the stimulus of a larger responsibility and with a wider scope for his activities he comes in time to more than justify the recommendation made by the board with some misgiving. It is not only that examiners are human; candidates are human too and have all the faults and all the virtues of other people.

Now, under the old system, the presumption of right to promotion depended on the candidate's experience and in the absence of distinct and well sustained evidence of a counterbalancing fault or deficiency he was passed. The reports of fitness, so-called, were really in a sense designed to record unfitness, if discovered, and so absolutely in conformity with the system. In law it is held better for many guilty to escape than for one innocent man to suffer. The promotion by seniority may have rewarded some whose merit was not conspicuous but it rarely if ever so miscarried as to punish the truly meritorious.

The selection system is entirely different. With the purpose of adequately rewarding a few supposed to be conspicuously deserving it constantly blasts the future of many who rightly or wrongly are equally or almost equally deserving, estimation of the relative deserts turning on varying shades of opinion. The placing of new wine in old bottles consists in utilizing for the purpose of determining merit a set of records gotten up not so much to show conspicuous merit as to record evidence of disqualifications. The reports of fitness are not a perfect instrument because it is difficult to obtain unfavorable reports due to cold, dispassionate judgment. An unfavorable report involves showing the damaging comment to the object of it and embodying his reply with the report. The reply often takes the form of retaliatory and incriminating revelations about the author of the unfavorable report, a circumstance which necessarily often restrains the reporting authority from being too conscientious. However, human nature in its more likeable aspects of charity, kindness and optimism often asserted itself in another way and led to passing over defects or irregularities that would have been noted had the consequences of perfect candor not involved possible disaster to a subordinate rightly esteemed to have in him much good to counterbalance the bad.

If I am right in believing that the testimony of the reports of fitness, part of a system of promotion by seniority, was of value mainly to prevent the promotion of the undeserving and therefore of great value to plucking boards, such testimony is not the ideal testimony on which to base promotion by selection. Officers who have served on boards of selection will, I believe, agree with me that there has been a very distinct, a very material and conspicuous alteration in the general type of replies to the interrogatories on fitness reports since selection became law. It should not for a moment be supposed that there is anything to be criticized in this. The change in the tenor of the reports is not wholly a conscious and deliberate one. It is therefore all the more significant of the inadequacy of the old form under present conditions. It is an effort to make it conform to the very different needs of the present.

Two suggestions are inspired by the foregoing considerations. Should there be a return, in the future, to promotion by seniority certain adjuvants to the working of the system could and should be introduced. If the plan now in vogue is to be permanent it requires modification in at least one vital point.

The suggestions regarding promotion by seniority are tentative, made with the purpose of inspiring men infinitely better qualified than the writer to contrive a definite, practical scheme for its regulation and control in the interest of the government and of the individual officer. Under the seniority system an officer who failed of promotion was entitled to reexamination at the end of a year. If he then failed again he was wholly retired. To be wholly retired is a fatal blow to any but the most youthful officer. A man who has been educated at the Naval Academy along more or less strictly professional and technical lines and has then devoted even ten years to strictly naval work may find it difficult to earn a decent livelihood. The difficulty increases with the time consecrated to the service. Except where failure of promotion results from definite moral deficiencies there should be some financial provision to keep an officer wholly retired from absolute destitution. The officer wholly retired within ten years of graduation is a relatively young man. The officer who has served 15 years after graduation has reached middle life. The latter should receive a small annual compensation. This should be larger for the officer of 20 years service and after 25 years of service subsequent

to graduation should amount to perhaps three-quarters pay, the amount now authorized by law for those retired for longevity. With some such provision the eliminating action of examining boards would unquestionably be considerably increased and to that extent there would be a premium on positive merit and an accomplishment of the purposes contemplated in the establishment of such boards.

Another aid to the seniority system would be the creation of a Classification or Assignment Board which would have power to determine and restrict the field of labor of an officer in whom talents were unequally balanced, in whom conspicuous abilities along important lines were offset by limitations or defects reducing his efficiency for any and every type of service. There must come sooner or later, and already there are abundant signs that the best naval thought and conviction recognizes the truth of the contention, a more general and a more active acceptance of the importance of what may broadly be designated the personal equation in military administration. The importance of the study of personality has already shown itself in efforts classified under improvement of morale, in psychological tests of efficiency, etc. So rapid and revolutionary have been the recent changes and readjustments in social, financial and industrial life in this country and throughout the world that military administration, always a matter of peculiar difficulty in this country, is more than ever the feature of our service upon which the great issues eventually depend. The disciplinarian of fifty years ago would be an insupportable anomaly to-day, and yet discipline, strict and uncompromising, remains and always will remain the sheet anchor of an efficient service.

It is time that the service took cognizance of the fact that the officer who is unsuccessful in handling men should not be assigned to handle them. The brilliant mathematician, strategist, exponent of military law or history; the man qualified for diplomatic and intelligence work, for teaching, for scientific research who cannot handle men must not command a ship and breed discontent and foment desertion, displacing from command or delaying advent to command rank of those gifted with the personal and temperamental qualities making for successful command. If a perfect analysis could be made of all the feelings, forces, dispositions and experiences which make up the sum total of honest and disinter-

ested dissatisfaction with promotion by seniority and consequent inclination to some other method, it would probably be found that promotion of those handicapped by temperamental unfitness for command was the essential evil of the system. But men unfit in this particular are promoted from the very reasonable feeling on the part of boards that such men can be useful servants in other lines. Unfortunately there is no definite policy or provision for diverting them from the field in which they can do harm and restricting them to the fields in which they can accomplish much positive good.

If promotion by selection is to continue it is high time that a well considered and well digested system be established for the determination of merit. The first and the most essential step in the writer's belief is the repudiation of the fitness report in its present form. If, for the maintenance of discipline and for the information that the present reports may furnish to the Department, these reports are retained, they should, for purposes of determining conspicuous merit, be replaced from some definite date by a wholly different type; and none can claim that anything but conspicuous merit should outweigh the combination of fidelity, intelligence, uprightness and experience, in the matter of eligibility for promotion.

Any one who has served on a selection board has had this experience. He goes over the reports of fitness of a given number of officers. A large proportion of them have approximately the same marks, the same favorable comments. If he and other members of the board are personally acquainted with the officers on the eligible list and personally acquainted with the reporting seniors the marks and comments can be interpreted intelligently and some estimate of a given candidate arrived at. If on the other hand Jones and Smith are wholly unknown quantities and the reporting seniors on Jones and Smith or a goodly proportion of them are likewise unknown, or but little known, the determination of merit comes down to an effort to determine which has the fewest discoverable defects.

But, in selecting for merit, defects may have a power to mislead. An officer may have a quick temper, he may be careless of minor details of routine procedure, he may even have virtues of a kind which involve him in minor troubles with superior authority and compromise his record and yet in the predominant note of

his character he may be highly qualified for handling big issues and obtaining large results. The very trifles which lead to a record cumbered by unfavorable comments in relation to the letter of the law may be indirectly the index of high capacity and sagacity. Such a man may be a born leader and consummately successful in inspiring loyalty and securing cooperation. Let us pit against him the negative character who, for very lack of initiative, enterprise, moral courage and determination to do his duty without fear or favor, never arouses antagonism or makes an enemy. He never commits a conspicuous error of judgment because he never dares to have a judgment of his own. He never incurs criticism in an important issue because he avoids issues. The slave of routine and the master of policy, he comes through unscathed from every situation that holds possible disaster for the man of daring and resolution. Such a man's record may, by its negative character, easily outclass the record of the man who does things and says things of value, the record being damaged by the occasional error or failure. The precept which makes a clear record indispensable to promotion by a board of selection thus stultifies the vital purpose of selection and becomes comparable to promotion by seniority when the latter is shorn of its prime feature—the recognition of the value of experience.

The danger of forcefulness is well illustrated by the matter of indulgence in alcoholics. It is certainly nothing against a man to be a total abstainer. Total abstinence, though occasionally due to the consciousness on an individual's part that through inherited or other limitations a single drink may lead to disastrous consequences, is usually credited to a man as an index of stoicism and fortitude. On the other hand the disposition to imbibe may indicate a jovial, social disposition and personal qualities not without value, while the tendency to get drunk and then disorderly may actually be due to an aggressiveness that often goes far in the business of life. Ten years ago moderate drinking was a perfectly legitimate indulgence. Twenty years ago it was a very general practice that entailed no opprobrium. One hundred years ago it was a virtue in the eyes of all but a few. The man who succumbed at one bottle of after dinner port was lower in popular esteem than he who could survive two, while the palm for manliness, both physical and moral, was awarded to him who could negotiate three. The four and five-bottle men were prodigies. We all

know that to take a drink may mean taking three or four drinks and the three or four drinks may lead to trouble. The trouble may get on one's record and may not. For lack of a full knowledge of the ways of Providence we ascribe the very dissimilar consequences of taking a drink to luck. We do not disqualify a man for promotion by selection because he used to drink but because he had the misfortune to have this incriminating detail involve his record. He may actually have foresworn liquor and been generally and markedly improved by the cruel experience; the experience may indirectly have developed character and led to enormous increase of potential. Such a record, however, placed side by side with the record of a blameless nonentity makes its possessor go down in the contest for promotion.

The prime need of selection is a constructive record, a record of positive achievement, of definite and conspicuous achievement; a record that shall be a blank in the case of mediocrity; a positive and not a negative sheet. Supervising authority may make such use in executive action as it may see fit of the chronicle of misdeeds and the board may if it so chooses modify recommendations because of previous errors, but the determination of merit should be primarily based on positive performance. Those on whom would devolve the task of preparing a form for a constructive record would have ample aptitude for this work and it is only in elaboration of the fundamental idea that the subject is pursued further in an elementary manner by way of illustration. Admitting that selection by merit is to widen the scope of usefulness for unusual merit, let the record call only for favorable entries, for entries of real and marked excellence of powers and performance. To-day if a man "has anything on his record" he will be passed over by the tribunal because the significant things in records as they are now gotten up are bad. Our idea is that a man who has nothing on his record should not be promoted; that is to say, the record should be a summary of good things done and of encomiums pronounced. We should so word its interrogatories that there would be no call for entries except in the case of a peculiarly meritorious act or unusually marked display of ability. There would be no call for any but favorable comment where that could be conscientiously made with the understanding that it determined fitness for selection for unusually important and responsible duty. The report would be headed "Confidential Report of Marked

and Unusual Qualifications for the Naval Service." It would be filled out by the commanding officer assisted by his heads of departments. There would be some such legend as this at the top of the paper. "This report shall not be filled in as a routine procedure but it shall be so transmitted. A blank report containing only the name, rank and station of senior and subordinate will be interpreted by the Department to mean that during the period he has been under your command the officer reported on has not had the opportunity or occasion, or else has not had the capacity, to conspicuously distinguish himself from others of like station and duties. This form is not to be employed for reporting negligences or derelictions of duty and conduct. A form forwarded in blank does not mean censure but merely that unusual and conspicuous ability segregating him from the average officer has not been shown."

The phrasing of the reports would be on this wise:

I have been *particularly* impressed by.....
 I consider this officer *more than ordinarily qualified* for.....
 This officer is *preeminent* in.....
 This officer has displayed *conspicuous* courage or gallantry.....
 This officer is *peculiarly adapted* by temperament, bearing and viewpoint
 to
 This officer is *unusually diligent* in the study of.....
 This officer is *more than ordinarily gifted* as.....
 State the particulars, if any, wherein this officer appears to show *exceptional*
 ability
 This officer excels other officers of his grade and station under my
 command

These incomplete sentences are inserted to show the degree of merit which would demand notice and no attempt is made to cover technicalities such as drill, navigation, engineering, teaching, organization, discipline, etc. These should of course be covered in detail.

It might be well, in view of the significance which would attach to the report, for those devising it to consider the wisdom of allowing space for an expression of opinion from the heads of departments in which a subordinate did duty, given in their language, over their signatures, endorsed, modified or negated by such remarks as the commanding officer saw fit to make. The captain may not always be in a position to have as full a knowledge of a subordinate's capacity as another officer. The executive offi-

cer, for instance, may be consulted and express a highly favorable opinion which the captain may rightly or wrongly not show in his report. Either officer is likely to be in error but it may happen that the executive's judgment is the better in a particular instance and since we would here be dealing in praise the situation is totally different from that in which blame is involved. Blame from the commanding officer calls for punitive action by or through him and he should not be compelled to initiate it against his own conviction of guilt or innocence.

What would be the practical result of the *constructive system* of records? At the end of 5, 10 or 15 years there would be a certain number of officers whose records would not contain a single entry relating to marked, unusual and conspicuous talents or accomplishments. Others in the same grade would have perhaps one or two such entries. They might all relate to one feature or the several reporting seniors might emphasize different aspects or qualities calling for special commendation. There would be a few officers whose records would show grounds for praise in many particulars and almost uniform agreement on the part of the reporting officers. With what comparative ease and justice a selection board could sort and classify reports of this type. The negative characters would be grouped together, likewise the men eulogized for a single praiseworthy characteristic. The smaller number whose numerous claims to recognition were concurred in by many superiors would form still another group. If the promotions authorized were few they would perhaps be made from the last of the classes given. If many promotions were called for the men in the other categories would be taken into consideration.

Naturally such reports would mean little for the younger officers whose service and opportunities had been limited but the lapse of time would produce an ever increasing differentiation between the positive and the negative types.

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SOME SOUND PHENOMENA CONNECTED WITH GUN-FIRE

By COMMANDER GARRETT L. SCHUYLER, U. S. Navy

This discussion of some of the simpler points in the sound phenomena of gun-fire is in no sense original. In fact, the theory was clearly stated and published years ago, although until the war it was of no special popular interest. Since then, however, these phenomena have taken on a new interest, because so many at the front heard them and occasionally their safety depended upon an intelligent understanding of them. One is impressed by the great extent to which those of all ranks in various armies who have had active service with artillery know the facts connected with the peculiar noises heard, even if in all cases they have not heard much about the reasons for them. In the navy this information is for many reasons much less widely diffused. There are certain striking and easily remembered conclusions which we may well spare a minute or two recalling to mind, or which might be included in future text books on naval gunnery. There are one or two special naval applications of the phenomena that may be mentioned, and a few popular fallacies which can be disposed of. One may therefore perhaps be pardoned for referring here to phenomena which are so largely a matter of common knowledge.

A projectile moving at a high velocity generates a sound wave of conical shape with the projectile always at its point. It is quite analogous to the V-shaped bow wave that a ship makes when under way. Bow wave analogies are perhaps the easiest way to illustrate the sound phenomena. For low speeds the sides of this conical sound wave make a large angle with the axis of the projectile, just as at slow speeds the bow wave of a ship is pushed along and stands out at a large angle on either bow. High velocity projectiles make a conical sound wave of a more acute angle, just

as at high speeds the bow wave of a ship extends behind at a much smaller angle with the keel. The semi-angle of the wave, that is, the angle between the direction of motion of the object producing it and the line of the advancing wave front, diminishes as the speed increases. The sine of this angle is the ratio of the velocity with which the disturbance is propagated in the particular medium, and the velocity with which the object producing the disturbance moves. If, for example, the projectile moves twice as rapidly as sound travels, the sound wave extends out at 30° on each side of the projectile, 30° being the angle whose sine is one-half. This can be verified by a simple geometrical construction. As an origin, take a point on the paper and assume that it represents the location of the projectile at a selected instant. The idea is to construct the form of the sound wave at the time when the projectile is at that point. On some appropriate scale mark back from this origin the path by which the projectile arrived. On this line choose other points at intervals, each representing the projectile at certain earlier instants. Take each of these points and consider the time the projectile took to get from it to the origin. See how far, according to the scale, sound would travel during this interval of time. From the point draw a circle of radius equal to such a distance. The envelope of these circles, or the line which could be drawn around just touching and enclosing all of them, will thus define the wave front at the time when the projectile is at the origin.

If the projectile is moving at a constant speed, then the radius of each circle and the corresponding distance from its center to the origin will compare in the ratio of the velocity of sound and the velocity of the projectile. If the projectile moves at a varying rate, or on a curved path, the wave front will not be composed of these two straight lines, but will be somewhat distorted, just as the bow wave would be from a ship in deep, calm water if it steered a changing course and went at a varying speed. By laying it out in detail the special form of the sound wave in any given case can be readily arrived at.

We have many evidences that this conception of a conical sound wave being generated by a high-velocity projectile is reality, and not a mere hypothesis. Spark photography is perhaps the most convincing evidence. A projectile moving in the dark touches two small wires and causes an electric spark of extremely short

duration to be made just over it. A sensitized photographic plate lies below it and a shadow picture is made. On the shadow picture a silhouette of the projectile, which was illuminated for only the briefest interval of time, is shown clearly and dark with very distinct edges. Perfectly sharp lines represent the sound wave previously described. This representation of so intangible an object as a sound wave results from the fact that the density of the air in it is greater than the density of the air around it. The index of refraction in a sound wave is different. Consequently rays of light passing through this region from the spark to the photographic plate are slightly deflected in passing. They turn differently, and so on the photographic plate no ray arrives which would pass directly from the spark in a straight line through any portion of the sound wave. There is a dark line on either side, as sharp and clear as the shadow from a wire. Knowing the velocity of sound and measuring the angle between the sound wave on either side and the axis of the projectile, we can estimate the velocity of the projectile. The velocity of the projectile can be measured by other means, and the agreement is a convincing check on the correctness of the theory.

When on the front one hears an enemy long-range gun dropping shells in his vicinity, there is at first a loud report, then a whistling noise and then the report of a shell exploding. Many are likely to think that the first report heard is caused by the discharge of the gun. If the matter is studied it will be found that in general this report occurred so closely before the fall of the projectile that it could not possibly have come from the gun and arrive so soon after the projectile. Furthermore, this first report is much too loud to come from a distant gun, particularly with an unfavorable wind. Yet it is always heard in any kind of weather. It is merely the sound wave from the projectile.

Experienced observers in well established parts of the front can tell with surprising accuracy just where projectiles are landing. The sound which reaches an observer seems to come from close on either side of a point in the trajectory where the component of the projectile's velocity resolved toward the observer is equal to the velocity of sound. If on one day the enemy is shooting low and on another day the projectile is a little higher, in both cases the point from which this false report apparently originates is very nearly in the same place as regards the observer. In the two

cases, however, the distance that the projectile travels beyond these points before exploding on the ground may vary considerably. Hence the interval between the sound of the false report and the sound of the projectile bursting may be quite different in the two cases. It may be, for example, an interval of four seconds in one case, and eight seconds in another. It is quite easy for the trained ear to distinguish, and the difference is sufficient to indicate with surprising accuracy where the projectiles are going. It should be understood that the estimate is made not by working out by formulas, but in a simple practical way. The observer finds out on different occasions where the projectiles are landing, and remembers, or notes down, what it sounds like. If he hears that sound again, he knows where the projectile is falling to cause it. It requires no intelligence, but only a memory, and many do it very well without being able to tell how they do it. It is interesting, perhaps, for those of us in the navy to know that this can be done, though it may not have any special naval application.

Another thing that should not be lost sight of is that the false report comes from a point which is not in general between the observer and the gun, and therefore, if he tries in this way to guess the location of the gun which is firing projectiles landing to one side of him, he will be entirely misled. Of course, if he knows where the guns are he can recognize one or the other by the similarity of its sound and the sound which he previously heard from it; but he could not locate a new gun in this way. It would be much like an observer off a port in a small boat in calm, foggy weather, feeling the bow wave of a steamer which had just come out of port and was passing near him in the fog. If it were an old experience he could compare it with what he had experienced before, but without previous experience he could tell the direction from which the bow wave seemed to come to him in the fog but this would not indicate to him the direction of the port from which the ship had started. Artillerists are always cautioned not to do this kind of guessing unless they know where the guns are and have heard them before. This does not, however, apply to very distant firing, such as a general action miles away. In that case we hear the guns themselves, rather than passing projectiles, and it is possible to make a very fair estimate of the direction of the artillery activity.

In naval gunnery where the remaining velocity of the projectile is greater than the velocity of sound, it follows that one will never hear the approach of the projectile which strikes him. It is the same thing as the proposition that a relatively motionless ship is not going to be rammed by a high-speed vessel which does not change its course and from which we experienced the passing wave.

A fallacy which one often hears is that the impact of projectiles on the water makes a loud noise like a report. Those who hold this view have usually arrived at it from noting that on target practice there is a loud report, which is not the discharge of the guns, and which can be heard on the towing ship at about the time the projectiles strike the water. They assume that this impact is what makes the noise. It is nothing more than the sound wave of the flying projectiles which reaches them.

Although usually only the false report made near the end of the trajectory is heard, it is possible under certain conditions to hear more than one such report. This is particularly true in very curved trajectories. It is no more difficult to comprehend than would be the arrival of bow waves at different times at a small anchored boat from a large vessel steaming around near it with considerable variation of course and speed.

If a projectile falls short of us the wave continues on and reaches us, as explained before, and the report is not a noise caused by the impact of the projectile on the water. A wave generated in the air has simply travelled on and reached us. It is like a vessel coming towards us at high speed, and suddenly stopping engines and anchoring. If not too far away her wave would leave her and travel on to reach us. It would not be a disturbance generated by the ship stopping, but would be the arrival of a disturbance previously accompanying the ship but continuing on after the ship had stopped.

In naval gunnery when we are near guns firing (either on the same ship or on one with it in formation) echoes often return. It is surprising what an excellent reflector of sound the side of a near-by ship can be. This is often noted with boats passing near the proving ground.

When one is fairly close to a gun which is firing he often hears a double report. One is the false report from the projectile, the other is the report from the gun. Illustrating by analogy with

waves on water, it is much like dropping a heavy toy boat into a tank and immediately starting to tow it along. There would be a circular wave from the original splash where the toy boat fell in and started from, and there would be the V-shaped bow wave which it carried along while being towed. We could select many points where both of these waves would be experienced separately, and in some places where they would be experienced separately they would be of very nearly the same character. Thus, it is not surprising that in the field at certain distances, and on certain bearings from a gun, a single gun may sound like two guns being fired. This happens sometimes at sea.

The principal conclusion that we can draw from this discussion is that all points of the theory of the sounds are well understood and were worked out years ago. There are very great differences in the characters of sounds which we are likely to hear on shore with artillery. This enables artillerists to tell a great deal from sounds, but their success depends almost entirely upon knowing local conditions, knowing where the enemy's guns are, and, having heard something which they can find out about, remembering what it sounds like so that it can be recognized if it is heard again. At sea these advantages are not possible, and noises from gun-fire, in themselves, can tell us little. We can, however, judge approximately the direction of distant firing. The sharp report just before the projectile lands would be a most misleading indication of the direction from which it had come. One could not hear the arrival of the projectiles which strike the ship. On occasions, double reports may be heard. The reports which one hears on target practice when projectiles strike the water are not made by impact, although it often seems as though such were the case.

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THE SOUL OF THE SERVICE

By CAPTAIN E. P. JESSOP, U. S. Navy

Motto: "Lest we forget"

At the present time when the influence of our rapid naval expansion during the Great War and the subsequent demobilization of equal rapidity have left the service shaken to its foundations, uncertain as to the future, harassed by present requirements, and bewildered by the general chaos, it would appear to be in order to attempt to restore orderly and logical thinking on the needs of the service with special reference to measures necessary to prevent permanent injury to service morale and service viewpoint from the peculiar kinds of slackness which any war must develop and which the circumstances of this war did develop to a rather marked degree.

The efficiency of the navy must always rest on the attitude of mind of the commissioned personnel to such a degree as to make all other considerations negligible.

It must be thoroughly appreciated that the officers of the navy are the only persons whose interest in the navy is anything more than temporary, since secretaries of the navy come in and go out with the tide of political preferment with all the attendant civilian organization, and the enlisted personnel is eminently transient.

Such being the case, it is to the officers we must look for the vital spark which is to rejuvenate service morale by the necessary tautening up all along the line.

Before beginning with the enlisted personnel it is necessary that we take the necessary measures to ascertain whether slackness does not exist in the officer personnel and eradicate that. Such a procedure must necessarily involve an open discussion of the principles of training which made our officers so remarkably responsive to the almost impossible demands made upon them by our entry into the war.

For years we had been striving to anticipate the requirements of the next war, and had diligently studied methods of foreign services as well as devising new methods of training and organization with an eye single to the improvement of our service and with the star of battle efficiency for point of aim, but always with the knowledge that in all human probability we were falling far short of a truly comprehensive estimate of the situation, which knowledge, however, only acted as a spur to greater endeavor.

The war is over and we now look back on it in an attempt to discover wherein we have failed and wherein we have succeeded in living up to the high ideal of service which has been driving us on for so many years.

A study of the activities of the officer personnel of the regular navy during the war cannot but impress upon one the assurance that, whatever the cause, they measured up to and beyond our most sanguine expectations, spreading their influence over the raw material which was thrust into their hands to use in lieu of the trained men to whom they had been accustomed, in such a manner as to reduce the deleterious effect of lack of training to a negligible quantity.

It therefore becomes evident that our training prior to the outbreak of war was basically right, and our object now should be to return the service to the road it was traveling before the war, with the additional asset of actual war experience to draw upon for improvement.

The proportion of officers of age and experience is not nearly the same as it was prior to the war when compared to the present total number, this being strikingly brought out by the recent general order making the Class of Eighteen eligible for promotion to the rank of senior lieutenant. Prior to the war the Class of Eighteen would now be beginning the last year of the ensigns' cruise, and it would have at least a year or two in the junior lieutenant grade to look forward to before being eligible for promotion to senior lieutenant.

It would seem axiomatic therefore that the training period of officers at sea has practically been done away with by force of circumstances, particularly with regard to those attributes which make the all-round efficient officer and which require, for proper indoctrination, close supervision by the older and more experienced personnel.

In order to rearrange our previously established methods to meet the new condition it will be necessary for us to study and determine just what principles of training of the officer personnel were sufficiently well established prior to the war to have a determining effect upon the standard of ability shown during the war, and which of these principles are now affected by the new condition.

To do this properly it would seem necessary for each of us to go back in our minds to our own beginnings in the service and to decide what conditions and experiences were instrumental in giving us individually the various attributes which we consider had to do with the resultant standard to which we think we measure up.

It must be admitted that we may overestimate our own ability and may think we have attributes which we have not, but that should not prevent us from knowing the parts of our early service life which tended to give us the attributes which we think we have and which we know are the attributes which make for efficiency in the naval officer.

There will of course be differences of opinion as to what these high lights in the character of an officer should be, but a starting point must be had, and the list below expresses as nearly as the writer can his opinion of the most important of those qualities :

- (a) Broadmindedness.
- (b) Zeal.
- (c) Intelligence.
- (d) Ingrained sense of duty.
- (e) Willingness to accept responsibility.
- (f) Knowledge of proper use of authority.
- (g) Fairness.
- (h) Good judgment.
- (i) Decision.
- (j) Sympathetic understanding.
- (k) Technical qualifications.

Many of the above attributes are so closely related that it may seem there is some repetition in the list, but it is believed that they are sufficiently different in spite of their close relation to make it necessary to maintain their separation. No attempt has been made to mention them in order of their importance, and in truth they all seem so essential as to preclude any such arrangement.

Broadmindedness is essentially a product of age, experience and proper association. No young person is broad minded, but on the contrary all young persons are inclined to be intolerant, hypercritical, and more or less self-sufficient and dictatorial when freed from the curb of superior authority.

Our younger personnel have an added incentive to make them tend toward the ultimate in all the above characteristics in that they are chosen men who have been put through a grind such as no other students in the country except those at West Point have to go through and they distinctly feel themselves to be the "survivors of the fittest" and this gives them, or tends to give them, a "wiser than thou" attitude when thrown with the common herd.

Formerly we have had a remedy for this particular ill in the subordination of the junior officer on board ship.

In the old passed midshipman days when the naval babe was not born with a commission in his hand, springing a full-fledged officer from the foam and froth of an academic education, we had quite an opportunity to apply the hypodermic of disillusionment to this inflated self-esteem, but since that period we have had increasingly less of such opportunity, until to-day we have practically none, and what little we do have is lost in the confusion wrought in our simple sailor mind by the blaze of gold on the sleeve of the infant.

One becomes more and more tolerant as the years accumulate on his shoulders, but only when one is thrown closely with his fellows under supervision, since tolerance is the result of age and properly controlled association, a wearing away of the sharp points by rubbing against those of his brethren, and shipboard is the ideal place for that process, *when proper subordination is expected and required of youth.*

The first two years at sea in the life of the young officer have more to do with his ultimate efficiency than is generally realized, for it is there that a true subordination and a strict sense of duty can be instilled, and must be if the officer is ever to attain his maximum efficiency in the service, and it is a far simpler thing to effect this with one who is still on probation than with one who has passed the probationary period and whose place in the service is practically assured.

It would appear to be possible to effect this by relegating the newly made ensign to the old subordinate position of the passed midshipman during his first two years, but it is not so simple as it looks, due partly to the assured position in the service conferred by the commission, and partly to an inherent service feeling that a commission stands for certain rights and status to which the old passed midshipman never dared aspire, and regardless of how intangible this service feeling may be, yet it has a concrete effect on the attitude of the older officers, and a resultant deleterious effect on the young.

In addition to the above we have the old requirement of three years as ensign discarded and the young men who should just be passing their final examinations for a commission now receiving their commissions as senior lieutenants. That, it is conceded, is a condition brought on by the war, but all our energies must be bent toward the proper training of these officers of relatively exalted rank when compared to old standards, so that the effect of rank may not have a permanently ill effect upon them.

In all fairness it must be appreciated that this not an attack on the younger generation, nor is it an attempt to hold their supposed deficiencies up to ridicule, but it is simply an expression of opinion as to the effect on the service of certain conditions which are different from conditions before the war, with no question of their necessity at the time, but a great question at the present time as to the effect of their continuance.

The first principle of the old training of the passed midshipman was that he was a subordinate for training. All his activities were supervised and passed upon by the senior officers, and this in no casual manner but with the greatest interest and care.

The generally accepted method of accomplishing this supervision was to assign each midshipman to duty as junior officer of a division, and, as far as possible, have all his duties in association with his divisional officer, thus giving that officer a feeling of responsibility for his midshipman and making a community of interest between the officer and the midshipman, which assisted greatly in educating the latter in all those things of character which cannot be taught from books, but which are so large a part of a naval officer's equipment.

To-day we have practically none of such association since the midshipman is gone and we have instead a young man with a

commission in his hand and already established in the service. A young man to whom the wardroom is not more sacred than the steerage and to whom entry into the cabin is no longer a matter to quicken the pulse.

The respect and admiration of the midshipman for the senior watch has long since passed and with it one of the most potent influences in character forming and one for which we have no proper substitute.

The insidious effect of the above condition is very strongly shown by the attitude of the younger officers toward civilians, in that the youngster presumes on his uniform much more than is proper and much more than has heretofore been the case. Several distressing incidents in the above regard have occurred recently in which the officer has shown very markedly that he considered his uniform absolved him from the necessity of ordinary politeness, thus showing a total lack of appreciation of the responsibility imposed by the uniform, both as to conduct and to all the other attributes essential to the gentleman and the officer.

It may well be that the incidents which have come to the attention of the writer are not so indicative of a condition as they appear, but the point at issue is whether the present condition in the service does not tend to increase the liability of such incidents.

Any officer who maintains or attempts to maintain his position in the particular community in which he may be temporarily located, by presuming on his uniform, is not an officer whom the service can afford to retain, since he lacks the instinctive element of gentleness which no other trait can replace. By proper association with his seniors in the service the instinct may be planted in the youth where it has not been before, and can be made to grow where it has lain dormant.

On board ship the life of the young officer for the first two years should be considered one of training, not only by the senior officers but by the young officer himself, and the attitude of the older officers should at all times be such as to impress this on the younger mind, not in a humiliating manner but in a way to cause the youngster to see the necessity of such training.

As stated above, broadmindedness is a product of age and proper association and experience and while age arrives without our interference we must arrange for the last two requirements.

There is no doubt that it lies within our power to provide these elements of training *if we set about doing it in a systematic manner* with a complete appreciation of the condition as it exists. We must therefore set ourselves the task of deciding just what kinds of service employment and what kind of supervision are necessary to accomplish the desired result. We eliminate immediately all shore stations and the sea adjuncts of shore stations as possible places for the training of the newly graduated youngster. These are no places for the young officer to learn any of the lessons of importance in the building of proper naval character.

The things which the young man must now learn cannot be taken from books but must be arrived at by absorption from the seniors surrounding him, and he will absorb little unless those seniors take a sympathetic interest in his training, and this they can properly do only where there are sufficient officers to make it unnecessary to give unsupervised authority. Authority he must be given but it must be supervised in order that he may be held up to the proper appreciation of the responsibility attaching to such authority.

This definitely places him in the large ships of the battle fleets for his first training at sea, but even this will not suffice unless his goings and comings are thoroughly supervised and his duty requirements are made as immutable as the laws of the Medes and Persians.

Personal convenience, desires and interests are the enemies of a true sense of duty and these are usually well intrenched by the time training in a sense of duty can be properly said to begin, because it must be admitted that nothing more than the most elementary start in this training can be accomplished at the Naval Academy. This statement will not be received with favor without some explanation.

The Naval Academy is a school, and, as is true of all schools where the students live entirely within the academic limits, the atmosphere will in many ways be artificial. This artificiality is particularly present in the method used to grade the midshipmen and give them standing relative to their fellows.

For this purpose every part of their work is passed upon and a definite mark of proficiency assigned which not only places them in their class but determines whether they may remain in the academy. The passing mark, the 2.5, then becomes the alpha and

omega of the desires and ambitions of approximately half the class, while class standing, determined by these marks, becomes the objective of those better fitted by reason of greater intelligence, better previous training, or greater ability in the assimilation of knowledge from books.

As a result everything in the midshipman's mind revolves around the 2.5 or class standing and the question of the usefulness of what he is being taught as it touches his future life in the navy seldom enters his head. This is as true of discipline as of any other study.

In addition to the above, until quite recently, there was no system in the application of discipline at the academy. Each discipline officer applied discipline in his own way and the result was so confusing to the midshipman mind that he gave up hope of understanding it and wormed his way through the maze of orders and requirements in the manner of least trouble to himself, and left the further thrashing out of the reasons why until some future time.

In the old days when the midshipman body was small enough to permit closer association with the officer instructor, socially as well as officially, it was possible to teach the midshipmen by example to a much greater extent than is possible at present when the number in each class is so great as to make it problematical whether the individual midshipman really knows all his own classmates.

To borrow a term from our friends the Boche, "Mass Psychosis" will always tend to prevent a proper grounding in discipline and sense of duty in the midshipman at the academy so long as the officers are so few as compared to the numbers of midshipmen and we must therefore recognize the necessity of such training under supervision during the first cruise of these young men in the fleet.

Much criticism is always being levelled at the academy for this circumstance but the greater part of it is unfair on account of conditions shown above and also because there are always some elements of training which require post graduate course, and training in sense of duty is distinctly one of these, and the fleet is the school for this, although it must be pointed out that the more the Naval Academy establishes systematic disciplinary training at the

time when the youth is most impressionable the less there will be for the fleet to do later.

There can be no question that, from time immemorial, there has been far too much unsystematic changing of the methods of teaching and applying discipline at the academy. Each new régime has more or less disrupted the methods in this regard, and, since régimes change about once in three years, and the junior positions are constantly changing, the poor young aspirant to naval honors has had quite a time keeping his sails trimmed to the wind, and frequently gets "caught aback" without knowing exactly why. To be more specific, we will take the subject of the relation of the first class to the other classes. This has run the full gamut from complete control to no control, the limit being reached when a first classman was liable to court martial if he attempted to correct a plebe in any manner.

Common sense should suggest that the present rule of commissioning midshipmen direct from the academy makes it absolutely essential that the first classman have training in handling subordinates to the greatest extent possible, and it should not be such a difficult thing to establish for all time the amount of control which is wise and necessary to give to the first classman in order to give him this training and, at the same time, hold him up to the responsibilities which go hand in hand with such authority. *It is in holding him up to his responsibilities and in making him feel them that proper training in a sense of duty and relations to subordinates comes*, and it is impossible to get this at the academy by any system which does not require control of the lower classes by the first class.

As it is at the academy so it is at sea. Authority under proper supervision engenders responsibilities which teach a sense of duty while authority without supervision breeds rather than diminishes tendencies to dictatorial and intolerant methods in handling subordinates, encourages bullyism, and altogether is far worse than keeping the youngster too subordinate; but there is a happy mean which just answers our purposes and which is perfectly applicable to shipboard life, especially now that the executive has a first lieutenant to take off his hands nearly all of the details of duty with regard to the condition of the ship materially.

The executive has now time to spend in supervising the training of the young officer under his control, to lay out his duties,

designate the limits of his authority, and above all to hold him up to the responsibilities engendered by the authority given him.

Perhaps the executives are doing this now ; perhaps they are not. Probably some are and some are not, but, regardless of what is, there can be no question as to what should be, and what can be, if it is taken hold of promptly by the whole service.

A strong belief exists that, for a term of years at least, there can be no more important duty for the executive, and it might not be amiss for the service to judge the ability of the executives by the kind of young officer they turn out of their ships, and it might be intimated here that it is highly probable that captains too will be judged by the service on some such basis.

It may be objected that this is again making the ship a school to the detriment of battle efficiency, but on the contrary all the things which go to make a ship efficient for battle are the things which can be best used in the training of the young officer in a sense of duty and in the other characteristics which go to make up the proper officer.

In the writer's own case the executive was by far the strongest force in the training of the midshipmen.

An indefatigable worker himself, he saw to it that there was no lack of proper work for the midshipman. Duty once arranged was as inexorable as death and the income tax. Night and day, winter and summer, week in and week out, a watch in four, with the relief doing boat duty when in port, which meant the market boat in the morning through to the 1 a. m. boat from the Tomkinsville landing. While we rested we worked in our turrets, made out clothing lists, posted up our note books, growled at the first luff, and when all this was done, and not before, we hit the beach for an evening when in port.

We thought we were discontented, but we were not ; overworked, but we were not ; doing a lot of useless things, but we were not, since sponges could not have absorbed water at a greater rate than we absorbed the idea that duty was first ; that the customs of the service required this and that ; that signals were not signals unless smartly sent, received, and executed ; that the proper handling of a small boat may bring intense satisfaction both to the handler and to the spectator, and that nothing adds more to the reputation of a ship than smart boats. In fine, that every duty

was important when properly done, both for its immediate effect and on account of the training it gave.

Our grasping the significance of all this was, it is true, much delayed, but we were using the experience thus gained long before we really began to realize its true importance.

He taught us all the things of character laid out in the list above. He was all of them himself and steadily impressed them on us. It is true we did not absorb all of them in full measure because all human beings are not endowed with sufficient soil for such a multitude of seeds to grow in, but within our limitations we got from him all we were able to contain and have been running on that foundation ever since.

From the fleet, as represented by the large ships, the young men should go to the destroyers, and to other small craft, and here we have another suggestion. The approach to the destroyers should be made through the small cruisers and gunboats rather than direct, as a more gradual change from the kind of discipline and duties on the battleship to the comparative freedom of the destroyer; but destroyer work they must have and it would appear that six months to a year in the small cruiser or gunboat would be sufficient, and the only drawback to that would be the objection that too frequent changes would have to be made in the cruisers.

On arrival at the dignity of executive of a destroyer, and before becoming eligible for command, the young man should be sent back to the battleships for a tour of duty. This return to the battleships is just as vital and will be just as prolific of good as any other part of the programme for the following reasons:

All the characteristics mentioned in the beginning of this paper with the exception of "technical qualifications" are dependent on the total routing out of intolerance, arrogance, dictatorial attitude and self-sufficiency. Age alone will not cure these defects and it requires the proper experience and association with those who have been through all the varying stages and who may be termed the post graduates of the system.

In addition, it requires a renewed appreciation of the more formal side of service life as represented in the battleship, a getting back to the more dignified atmosphere, if it may be so expressed, in order to complete and fix in mind for all time a proper service perspective.

In the destroyers the restraining hand of age and experience is to a certain extent lacking, since all the personnel is young, and he who passes through all the stages and becomes commanding officer without going back to the battleships will have a distorted perspective, and will still retain some of the seeds of intolerance which will be more firmly fixed in his character by the authority of command.

There is not any training in the service more prolific of good than the destroyer training, when properly applied, and, conversely, there is none more dangerous, when carelessly applied.

Just how long the young man should remain in the battleship this second tour is largely dependent on the individual. Any young man who shows that the strict discipline and routine of the battle fleet is irksome to him should not be sent back to the boats until all that has been routed out, while the one who shows a proper appreciation of such discipline and routine may be sent back at any time.

Is it too much to say that in the above lies our greatest present problem? Is it too much to hope that the service individually and collectively will seriously consider this question paramount and address itself to the solution with all the enthusiasm and seriousness of which it is capable? Is it too much to suggest that the Personnel Bureau consider this question when gazetting executives to ships, in order that those best fitted by their known characteristics may have proper field for their use?

Would it be amiss to suggest that the Naval Academy institute a series of lectures to enhance service interest among the midshipmen, and that the lecturers be drawn, not from the ranks of the clergy, the Y. M. C. A., or allied interests, but from the fleet, which is the service? That these lectures be not on professional technique, but on the service, its customs, its importance in the national scheme, its honorable place in the nation's history, and, above all, on that indefinable something which lifts it above greed, avarice, self-seeking, all commerciality, and makes us glad to take as our reward for services rendered the approbation of our cloth—in other words the soul of the service?

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A PRACTICAL TEST OF RADIO COMPASS SHORE STATIONS

By LIEUTENANT HAROLD O'D. HUNTER, U. S. Navy

An experimental comparison of the course of destroyer *Charles Ausburn* as determined by the usual navigational instruments and by radio was made on July 9, 1920, in connection with the calibration of the Radio Compass Stations at Hog Island, Va., and Cape Henry, Va. This test was made at the entrance to Chesapeake Bay over a course of about 30 miles, the object being to ascertain the relative accuracy which may be expected from the Chesapeake entrance group of radio compass stations.

The conditions of the test were as follows:

(a) *Charles Ausburn* to take a position at least 25 miles from Cape Henry Compass Station and to fix its position exactly by navigational instruments.

(b) *Charles Ausburn* at position (a) to transmit by radio for 3 minutes on 800 meters.

(c) *Charles Ausburn* to proceed for 15 minutes on any course, obtaining position at end of this period, and to transmit for period of 3 minutes.

(d) *Charles Ausburn* to repeat above procedure until advised by compass control station to discontinue tests.

The calibrating party was stationed at the Cape Henry Compass Station. Six readings were taken on the ship at each fifteen-minute fix. The average of these readings was taken in connection with the average of six taken by the Hog Island Compass Station in determining the ship's position by radio by the usual triangulation process.

The Hog Island bearings were extremely difficult due to the slight angular changes between fixes, since the course of the ship was directly away from the Hog Island Station. Hog Island

was further handicapped by having to work without a compensator and with a minimum relatively broad.

All navigational fixes of the *Charles Ausburn* were carefully computed by the author and plotted. Then the true bearings of both Cape Henry and Hog Island were taken from the largest scale chart available. The comparative bearings are shown in the tabulation below.

TABULATION OF BEARINGS

Ship's bearing by Cape Henry radio compass	True bearing Cape Henry from ship's fix	Ship's bearing by Hog Island radio compass	True bearing Hog Island from ship's fix
55.24°	55.4°	151°	151°
59.4	59.66	156	155.5
67.5	66.93	159.25	159
74	73.93	162.5	162
81.17	81.17	164.75	164.5
89.4	89.4	167	166.5
96.16	96.16	168.25	168.25
90	89.16	169.75	169.5
81.5	81.5	172	171.25
69	72.5	175	174.5
62.75	62.75	179	179
53	52.4	183.5	182

The above tabulation shows the actual results that may be obtained from shore radio compass stations. The maximum error in any bearing is 2.5° and the average is less than a degree. The photo print Sheet 5A of U. S. Coast and Geodetic Survey Chart No. 122 upon which has been traced the ship's course as found by both radio and navigational methods is of interest as indicative of the utility of the ether-wave method of navigation.

It is to be noted that the maximum error between the ether and navigational fixes is 1.25 miles and the average error is about a quarter of a mile. Of course as a ship gets nearer a station the more accurate will be the bearings. This experiment is merely a confirmation of the radio compass service daily being extended to shipping by the Chesapeake entrance compass group, and in view of the possibility of some error in fixing accurately the ship's position by navigational instruments when drifting and under the influence of strong tide it is considered that equal care will produce equal precision whether by visual or by ether method. Since the visual method is out of question in thick weather the ship may still proceed with entire reliance by the positions flashed

to it through the ether. The careful navigator would not place complete reliance in one fix by either method. However, in thick weather by obtaining several radio compass fixes, noting distance run between fixes and soundings, port should be easily made by this method in thick weather.

Within the last year a very careful navigator received a general court martial for grounding in thick weather. He had used all the usual methods and precautions while making a landfall in thick weather and thought that he was well covered. However, one of the first questions of the Judge Advocate was: "Did you use radio compass fixes?" The findings of the court stated that he was guilty of not using all available means for fixing the position of the ship, as he failed to avail himself of the use of radio compass fixes. It is of interest to note that the radio compass stations of this country are operated by the navy. Those who actually operate the sets are electricians (r) of the navy's enlisted personnel. Most of the stations are in God-forsaken places. There are no amusements at most of them, the only other inhabitants being the members of the coast guard stations. Several days sometimes pass without the men on watch ever getting a request for a bearing. Consequently, they get somewhat disgruntled and careless. It is thought that if naval vessels will call for bearings whenever passing a station, whether in clear or in thick weather, it will impress upon the operators the importance of their duty and also give them invaluable practice. Commanding officers receiving poor bearings should always report them to the Hydrographic Office in Washington and District Radio Material Officer. In this way operators who are continually careless may be discovered and replaced. As long as radio compass stations are run and operated by the navy, it is the duty of the navy afloat to do all in its power to make it an efficient service.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TWELFTH REGIMENT (PUBLIC WORKS)
AT GREAT LAKES

By COMMANDER WALTER H. ALLEN (C. E. C.), U. S. Navy

The entry of the United States into the World War found the navy with entirely inadequate facilities ashore. For the first time in its history it was realized that the navy had many and varied activities other than those afloat. The new developments in warfare required vast preparations on land before great numbers of ships could be sent to sea. Aside from the largely increased work of ship construction, tremendous amounts of stores had to be assembled in buildings not even planned before the war. Factories for airplanes and mines had to be built and equipped before these aids to successful warfare at sea could be furnished. The means for assembling and training the five hundred thousand men needed were non-existent and the providing of such means constituted one of the largest of the land problems.

Every subterfuge was resorted to in order to care for the rapid increase in personnel until that personnel was ready for transfer to sea duty. Old ships were utilized, state armories and municipal piers were requisitioned, open-air camps were set up, portable buildings were erected—and all proved insufficient. Those who were studying the subject, and on whom the responsibility for providing quarters for recruits rested, realized early in June of 1917 that the only solution of the problem was a great enlargement of existing training stations and the construction of new ones. Such stations should be designed and built with regard for the kind of training to be given there and each fitted for its peculiar work. This expansion was definitely started in June, and during the summer of 1917 there was great activity in camp construction for the navy. But the demands of the navy afloat and

overseas, and the manning of merchant ships, caused a constantly increasing flow of recruits to the training stations. The beginning of 1918 showed that the new camps were still far too small to fulfil their purpose, and the following spring and summer, and even until hostilities ceased, camps were being enlarged and perfected with all possible speed.

Before the World War, few people in the United States had ever heard of the Naval Training Station at Great Lakes, Illinois. It was little known to the personnel of the navy itself. Situated near the center of the country and far removed from the coasts, naval officers seldom visited it unless official business required them to go there. The number of enlisted men who had been trained at Great Lakes was comparatively small.

All this was changed by the expansion of the navy during the war. The Mississippi Valley was found to be a splendid field for recruiting and a large proportion of the recruits from this section gained their first knowledge of the navy at Great Lakes. From a population of a few hundred the station grew in a year and a half to a camp of nearly 50,000 men. It was the Mecca for all those ardent spirits in our Central States whose patriotism impelled them into the navy.

Among the many interesting features at the Great Lakes Station during the war was the Public Works Regiment. It was an organization that was little understood by the navy at large. This lack of understanding has been the source of many groundless statements in regard to the work and purpose of the organization. It has been intimated even that this unit was primarily concerned in keeping men away from the fleet, whereas this regiment probably furnished more men, and more trained men, for ship and overseas work than any other regimental organization at any naval training station. It is the object of this paper to show the origin, growth, work accomplished and advantages to the service of the Twelfth Regiment (Public Works) at Great Lakes.

The Naval Training Station at Great Lakes experienced the growth common to the other camps. Tent cities sprang up all around the original station. Open-air mess halls and shanty galleys were improvised to meet immediate demands. Yet the great influx of recruits fairly swamped all facilities. There was an urgent demand for more barracks, mess halls and instruction

buildings, for great increase in the water supply and sewage disposal systems, for buildings for storage of all classes of supplies, for roads and trackage to make the new parts of the station accessible, and for increased hospital facilities to care for patients far greater in number than anyone had ever anticipated.

All these additions were started almost simultaneously, throwing a great burden of work on the Public Works Department of the station. Draftsmen and surveyors had to be found at once, material checkers and work inspectors for contracts were immediately necessary, clerks to keep track of cost accounts on contracts were needed; and to meet these demands with civil service employees was an impossibility. The very best way to meet them was to commission or enlist the personnel for this work. Men most suitable were not desirous of holding civilian positions. The uniform, the opportunity to do their bit as part of the navy and the chance of transfer later to more active war operations, made possible the assembling by the Public Works Officer of a very capable force to handle the new construction.

As camps were completed, power houses put in operation, railroad rolling stock and auto trucks increased in numbers, and other new constructions approached completion, the problem of maintaining and operating the station, with a capacity ten times that of pre-war days, assumed serious proportions. Again the Public Works Officer was called upon to assemble an enlisted force to carry on the operation and maintenance work of the station.

The organization at Great Lakes differed from that at most other training stations in that the Public Works Officer was not only charged with all construction of public work and the providing of all public utilities, but also it was his duty to repair, maintain and operate all these facilities. The organization, decided upon early in the war, had the advantages of centralizing this special work under trained supervisors and of relieving the regular training regiments from work that would only hinder the rapid training of men. It had exactly the same advantages that resulted from having one commissary officer provide and prepare the food for all the regiments and one paymaster handle all the recruit rolls.

Such was the origin of the Public Works force, a force composed largely of technical men, construction specialists and artisans. These men had navy ratings conforming as nearly as

possible to the work that they were doing or to the previous training that they had received. But the emergency that had made their services necessary had prohibited their receiving at first the preliminary rudimentary naval training given to other recruits and many of them carried on their duties in the Public Works Department from the day of enlistment and even while passing through the detention camp. They worked hard, often ten or twelve or fourteen hours each day, and for months some of them had no Sunday or any other liberty.

By December of 1917 this Public Works force comprised nearly a thousand men, a number so large as to require special organization for purposes of housing, muster, pay, discipline and proper distribution to the work. Accordingly this force was organized into the Twelfth Regiment (Public Works) and put upon a basis similar to other regiments of the station. The regiment was under the command of a line officer, assigned by the Public Works Officer from the force under him. This military organization was known as the "Regimental Division" of the Public Works Department and it controlled the whole Public Works force in all military matters. It had its own staff of officers and men purely to perform the regimental duty. The rest of the men in the regiment were assigned for purposes of work to other divisions of the Public Works Department, such as the Contract Division, the Clerical Division, the Projects Division or the Station Labor Division, and reported to these divisions for work each morning. The Regimental Division had no further control of them until their daily work was done. But, except for such day work, the Regimental Division had entire charge. It handled all questions of discipline, liberty, pay, clothing, barracks, messing, recruiting, transfers and drafts; in these matters the heads of other divisions had no jurisdiction, though they consulted freely with the regimental officer and made recommendations to the Public Works Officer in regard to the part of the personnel working under them. This organization of the Public Works Department was not attained in its complete form until the summer of 1918. Minor changes to perfect it were made as found necessary. But the plan instituted in December of 1917 worked smoothly from the start and handled successfully the Public Works force to the end of the war and throughout demobilization, a force that in August of 1918 numbered about six thousand two hundred men.

The Public Works regiment occupied five different camps, and the last one, built for its permanent home, was not completed until after the armistice. But as the great area and long distances of the station made it impracticable to carry on all the work from the main regimental camp, maintenance barracks to hold two or three companies were established in two other parts of the station. For operation and maintenance purposes there was a shop and a public works office located in each regiment and in each was a detail from the Twelfth Regiment. This detail handled all repairs of buildings and of water and heating installations and the operation of power plants within the regiment to which it was assigned.

Some of the new construction done by this regiment was of considerable magnitude. One regimental camp was built and later remodelled and enlarged to a capacity of 2000 men. Two other camps were doubled in size by the construction of detention barracks. The regiment erected one of its own maintenance barracks with a capacity for 450 men with mess halls, galley and power plant. The baseball and football fields and running track were filled in, graded and sodded almost entirely by men of the Twelfth Regiment. They built the grandstand and bleachers, seating fifteen thousand people, in eighteen working days. Small parties under competent junior officers did considerable work at other places in the naval districts, such as the erection of barracks at the St. Clair River Canal. The construction work performed by contractors but supervised by the Public Works force amounted to seventeen million dollars and included all kinds of camp constructions, not only buildings, but power plants, water, sewer, heating and electric distribution systems, installations for water filtration and sewage disposal and roads. With only two or three exceptions all plans and specifications for these works were prepared at Great Lakes.

But construction and maintenance of the station was not by any means the sole function of the Twelfth Regiment. On the contrary, this regiment proved to be the greatest training regiment of the station. If the Navy Department called for a draft of firemen, the draft was filled from those who had been tried out in firing at the many power plants of the station. If carpenter's mates were needed, men found efficient on actual construction work were selected. This same policy was followed in all the regular artificer ratings, for practically all recruits with artificer

experience ashore were assigned to the Public Works Department. There each was tried out, his ability was determined, the examinations for promotion in ratings were conducted and the selections for drafts were made from those found skilled in their ratings. The Training Station was called upon to furnish certain fixed weekly or monthly drafts in the artificer branches. All such drafts were filled from the men in the Public Works Department. Many drafts of men with special qualifications were sent out. Organized surveying parties were sent for work along the Atlantic Coast; draftsmen were sent to the Bureau of Yards and Docks; and inspectors were selected for the construction of the new Navy Department and War Department office buildings in Washington and for construction work at other places.

In March, 1918, the station was called upon to supply 200 men for the construction of aviation stations on the coast of France. Not only were these men supplied but the station informed the Bureau of Navigation that it could furnish from the Public Works Regiment a construction party of four or five hundred men, already trained and experienced in this class of work, together with their chief petty officers and officers—a completely organized construction unit. Three hundred and fifty men from Public Works formed half of a party sent overseas to build and operate an aviation station at Poillac. Many men were selected and sent for the building of the 820 ft. radio towers in France. Perhaps the best known of these special drafts from the Twelfth Regiment was the railroad party that assembled and operated the trains for the fourteen-inch naval guns that did such good work on the battle line in France. In addition to the selection of men from the Public Works Department to fill drafts, the regiment was called upon to select from the whole station men suitable for certain classes of training. It searched all regiments to obtain men to fill the drafts for the listener's school, the oil burner's school, the optical school, the various schools for machinists, and in fact for all such special technical training.

In order to help men to a better understanding of their duties at sea, an artificer's school was started in the Public Works Department under the Regimental Division. This school offered day courses for firemen, machinist's mates, plumbers and fitters, carpenter's mates and electricians. Night courses were given in mathematics, geography and history. In all courses seamanship

was taught. About 800 men were trained in the day courses and night courses gave instruction to more than 2000 men. All attendance was voluntary and in addition to the regular duties.

Meanwhile military instruction was not being neglected. Twice a week after supper drill was held for two hours for all men in the regiment; no liberty was granted until the drill period was over. Every man in the regiment could march and handle his rifle. A course for officers was started, first in rifle, pistol and machine-gun firing and mechanism, and later in larger guns and torpedoes. Though attendance was not compulsory, all officers of the Public Works Department gave two nights a week to this work.

Some of the officers and men taken into the service for special construction work remained with the Public Works Department to the end of the war; many others were transferred to other regiments of the station; a large number of the enlisted men obtained commissions, for the proportion of technical and educated men in the regiment was very high; but aside from all these changes in personnel, the regiment sent from the station for duty in the East, or aboard ship, or for transfer to France, more than 16,000 men, practically all of them skilled in some trade or profession.

This account of the Public Works Regiment would be incomplete without some mention of the characteristics of the regiment. The men averaged several years older than the ordinary recruits. A large part had had several years trade experience before enlistment. Many were married. They were not boys, but men, and this characteristic was particularly noticeable in parades because of their better physique and more mature carriage. They did not appear like a battalion of recruits but as a body of men who had found themselves. They looked businesslike. The spirit in all they did was most commendable. Though they worked long hours and received little liberty, yet at all times, no matter how prosaic and uninspiring the task, they seemed to realize that they, too, were contributing something of value toward ultimate victory. The greater the urgency of the job, the more they seemed to enjoy it. A strong regimental pride and *esprit de corps* developed. The discipline was excellent. The device of the Civil Engineer Corps, which the men wore on the left sleeve, meant to them a standard of work and living that must be kept high.

The Twelfth Regiment (Public Works) at Great Lakes demonstrated certain points worth noting. A brief summary of these points and the lessons to be drawn from them may perhaps be of future value, should a like occasion arise.

The first and most important point demonstrated is the great need of thorough military organization and control of men engaged on such construction and maintenance work. This need was not appreciated while the number of men was small. The great advantages of such organization were not foreseen nor were they half realized until the Regimental Division had demonstrated that by such organization the discipline, welfare and contentment of the men were vastly improved, and the efficiency of the Public Works Department was greatly increased.

Another point clearly brought out was the possibility and great advantage in time of war of doing certain construction and maintenance work with the enlisted force, such work as would ordinarily be done at other times by civil service employees or by contract. The troubles everywhere experienced throughout the United States with civilian employees, especially on contract work, were avoided by using enlisted men. Strikes, demands for increased pay, labor union control and jurisdiction, overtime work, were all eliminated. Concentration of force on the more urgent jobs was easily effected. Even questions of supply of labor and housing were simplified.

No attempt was made to do with the Twelfth Regiment work that might as well be done by contract, but that enlisted personnel can compete successfully with contractor's labor was shown by several works constructed. Some of these constructions would have cost well over the hundred thousand dollar mark. No claim is made that the use of enlisted artisans effects a saving in cost; in fact, construction by civilian force may be cheaper, when the cost of enlisting and caring for naval men is considered. But certainly in time required for construction and in quality of work done, the enlisted force does not suffer by comparison, under war conditions.

If this was true in construction work, it was even more true in the work of maintaining the station, in preparing plans and specifications for new work, in contract inspection, and in much of the clerical work. The quality of the specialists obtained by

enlistment and commission was far superior to any civilian force that could have been brought together through the civil service.

The results obtained in such construction work as was done demonstrated the entire feasibility and perhaps great advantage of having a large part of the construction work of the navy carried on by enlisted force in time of war. If this is true of work within the United States at such a place as Great Lakes, it would be even more true of work to be done in isolated localities or on a foreign shore. The absolute control of the force, the freedom from all labor agitations, the splendid morale as compared with contractor's labor, are points that go far toward gaining efficiency and speed.

The many times that Great Lakes was called upon to furnish construction parties and draftsmen, inspectors and engineers, showed that some provision should be made in any future war for regularly recognized sources from which such men can be obtained. The assembling and training of such a force should receive recognition and careful study. There might well be in the Naval Reserve a corps of technicians enrolled for this special work. These men would be among the first called in a crisis, for it would be their task to prepare the old camps for the influx of the main body of the reserve, or to plan and build the new camps. With such a body of technicians available at the outbreak of war, not alone the camp constructing, but also the maintaining and operating force, many valuable days could be saved in preparing to assemble and train the great body of the enlisted men of the navy.

The supply of skilled mechanics in the section of the country from which Great Lakes received most of its recruits was plentiful and it was not difficult to secure efficient workmen. As only tried artisans were sent on drafts, there was a saving in training of poor mechanics, and an assurance of the ability of men to do the work required in their ratings, and that the rating of each man was in accordance with his ability. The amount of weeding out aboard ship was reduced because it was possible to give a thorough tryout on land. Money and time were not wasted in transporting poor mechanics; and in the process of selecting qualified men much productive work was done.

The close of the war was the signal for the rapid decline and ultimate complete elimination of the Public Works Regiment.

The cessation of camp construction and the reduction of the station personnel made possible a quick demobilization of this force. Civilian personnel took the place of officers and enlisted men. In a few months the regiment ceased to exist. It had done its work. It had no place in a peace organization. Its record of accomplishment remains as a proud memory for those whose names were enrolled on the roster of the Twelfth Regiment (Public Works) at Great Lakes.

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THE ORIGIN OF GROG

By COLONEL G. C. THORPE, U. S. M. C.

Grog was a gallant hero before it was a drink.

Admiral Edward Vernon of the British Navy rendered distinguished service in the Baltic, West Indies and the Mediterranean, and was honored by Queen Anne when he returned from the capture of Gibraltar. During a period of quiet in British military affairs he entered politics and as a member of Parliament participated in debates demanding energetic enterprise against Spain. He was accused of speaking extravagantly. He assailed the government with severe invectives for its peaceful strategy and in a blaze of enthusiasm declared that *he* could take Porto Bello, the great Spanish stronghold in Panama, with a squadron of six ships. The government retaliated upon its critic by sending him out as commander of the West Indian fleet composed of the force that he himself had said was sufficient. As it turned out, Porto Bello had come by evil days and its defense was far less prepared than was expected in England, for the castle and city surrendered to Vernon on the second day of the attack—with small British casualties. When the news of the victory reached England, there was the wildest enthusiasm; Vernon was not only the “hero of the hour” but the hero of years; a year later his birthday was celebrated by the public illumination of London, and more than three years after the victory of Porto Bello, two disastrous campaigns intervening, he received the freedom of the city of London when he returned to England.

The admiral was in the habit of walking the deck of his flagship in a rough boat cloak called a *grogram*; as it was a peculiar garment it suggested a nickname for the popular flag officer and Admiral Vernon came to be known affectionately as *Old Grog*.

Shortly after the surrender of Porto Bello, the admiral introduced West Indian rum aboard ship and had a mixture of rum

and water served as a ration to the crews. It was intended as a preventive against fevers that had decimated so many European expeditions to the West Indies. When the sailors of the flagship *Burford* first tasted the new drink they found it most palatable, and as the enthusiasm of victory still ran high they named their favorite beverage after their favorite commander. Forty years later some verses were composed on the cruiser *Berwick* on the eve of Admiral Parker's fight with the Dutch fleet (1781) which bespeak the popularity of the man and the drink a quarter of a century after the man was dead. Here are the last two of the seven verses :

A mighty bowl on deck he drew,
And filled it to the brink;
Such drank the *Burford's* gallant crew,
And such the gods shall drink.

The sacred robe which Vernon wore
Was drenched within the same;
And hence his virtues guard our shore,
And *Grog* derives its name.

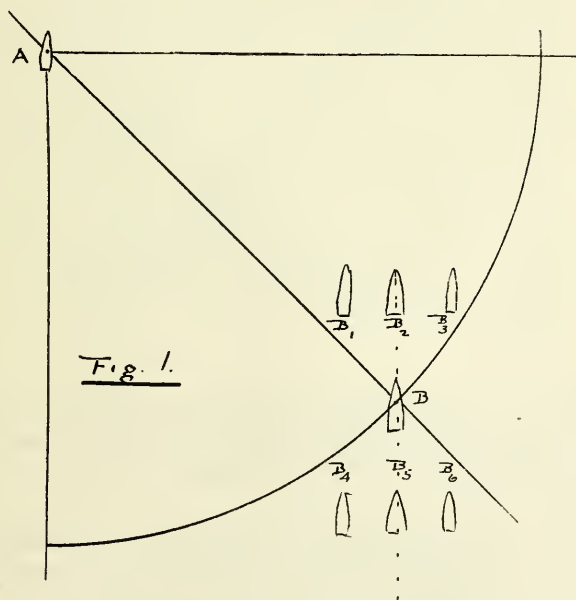
[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE MYSTERY OF THE LINE OF BEARING

By REAR ADMIRAL G. H. BURRAGE, U. S. Navy

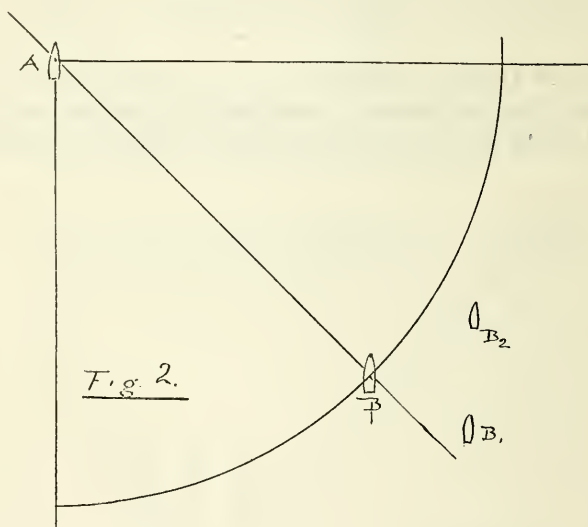
One of the troubles of the officer of the deck in formation is to understand the fundamental principle of getting into position in line of bearing and when out of position what to do to get back.



See Fig. 1. A is the guide, B is the correct position in line of bearing. B_1 , B_2 and B_3 are positions inside the distance and ahead of the bearing, which is all the information the officer of the deck is given. Each case has to be handled differently. All slow down but B_1 shears to right, B_2 keeps her course, B_3 shears to left.

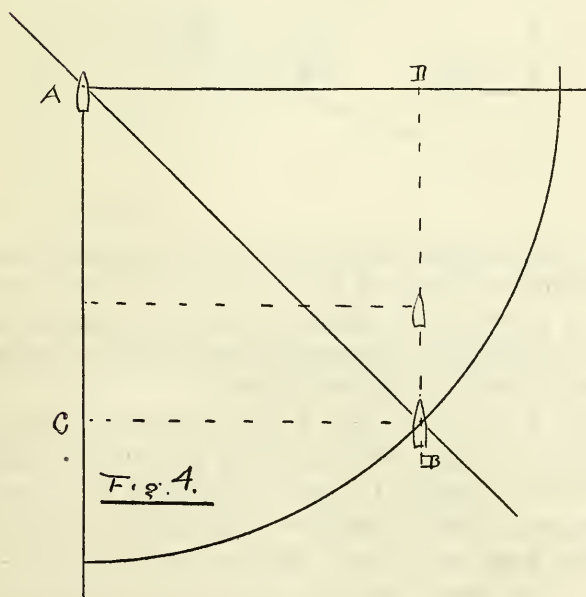
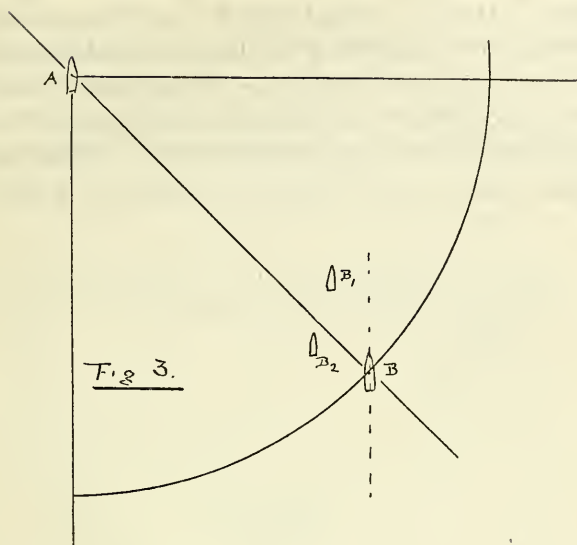
B_4 , B_5 and B_6 are positions outside of the distance and behind the line of bearing and like the above, the solution differs in each case. All increase speed— B_4 sheers to right, B_5 keeps her course, B_6 sheers to left.

See Fig. 2. A is the guide, B is the correct position in the line of bearing. B_1 and B_2 are outside the distance and ahead of the bearing. Both sheer to the left, but B_1 has to speed up and B_2 slow down.

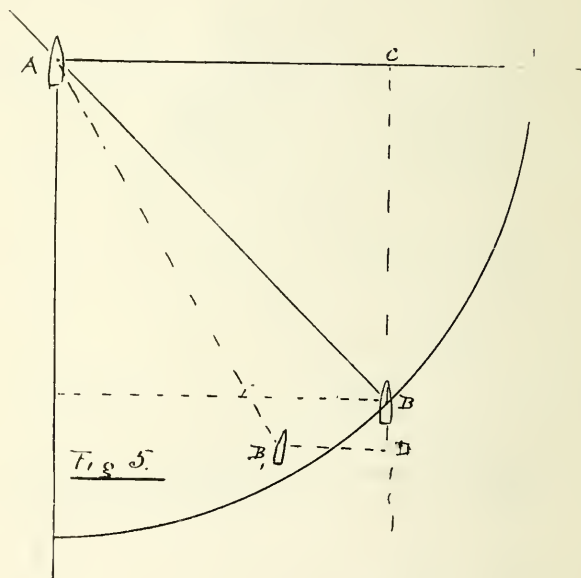


See Fig. 3. A is the guide, B is the correct position in line of bearing, B_1 , B_2 are both inside the distance but B_1 is ahead of the bearing and B_2 behind, yet both do the same, slow down and sheer to the right.

See Fig. 4. A is the guide, B is the correct position in the line of bearing. The fundamental principle is to separate the distance and bearing from the guide into its component parts at right angles ($B-C$) and parallel ($B-D$) to the course of the guide. By keeping the distance $B-C$ approximately correct, then it is simply a question of changes of revolutions to keep position; in other words, first keep on the line $B-D$, then correct bearing by slowing or increasing speed.



See Fig. 5. A is the guide, B is the correct position in the line of bearing. Draw a vertical line $B-C$ on the mooring board through the correct position B on the line of bearing, parallel to the course of the guide. With the bearing and distance of the guide the junior officer of the deck plots the position B^1 and gives the distance B^1D from the vertical line $B-C$. A ruler marked to the desired scale, in yards, simple to construct, pivoted in the



center of the mooring board will give the position B^1 in a few seconds and the distance B^1D .

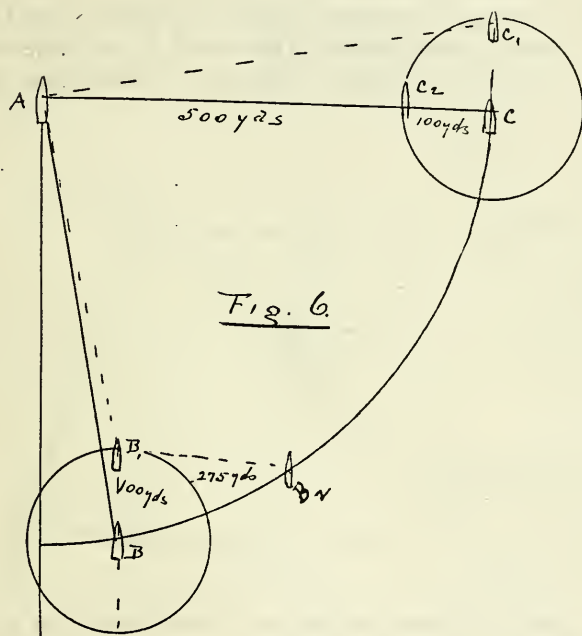
One of the things to remember is that the officer of the deck must not try to do all the things himself, that he is provided with assistants to help him produce results.

See Fig. 6. A is the guide, B and C are the correct positions in the line of bearing. Remember that in a one point bearing B , a small error of bearing B^1 , makes a big error in distance, B^1A , from the guide, when on the correct vertical line. There is great temptation when the distance decreases to sheer out from the guide. A ten degree change of course and no change of speed

will land B_1 in the position B_2 in $4\frac{1}{2}$ minutes if standard speed is 10 knots.

If the standard speed is 20 knots it will take but $2\frac{1}{4}$ minutes for B_1 to reach position B_2 with a 10 degree change of course.

Attention is particularly called to the fact that when near the correct bearing and with a large error in distance; change in speed



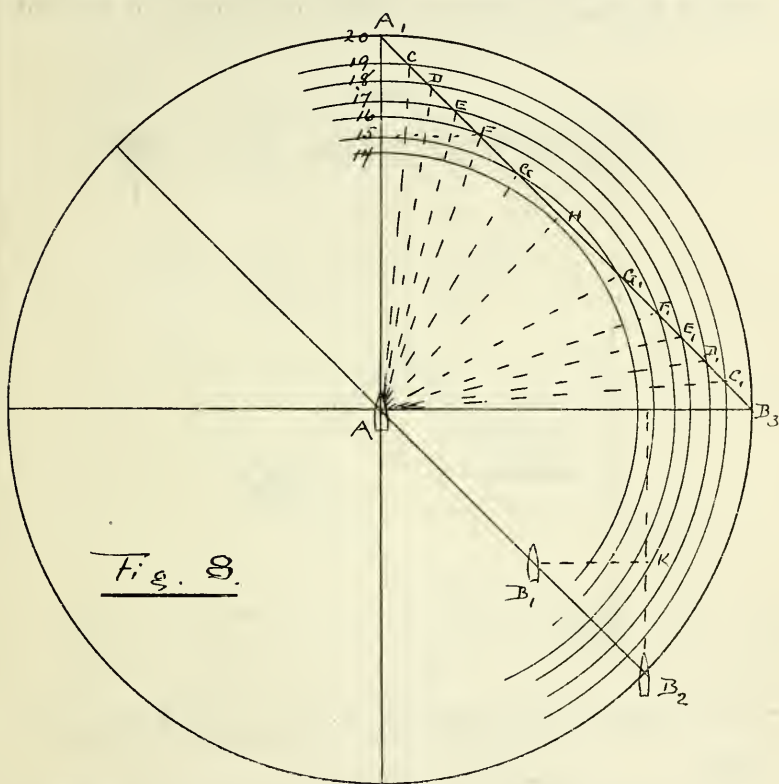
is the answer, on the 15 degree bearing, as at B_1 ; and change in course for the 90 degree bearing as at C_0 .

See Fig. 7. When on the 90 degree bearing and correcting your distance you are warned of the danger of too great a change in course as you may be caught with a signal to go ships right or left and the signal of execution within a few seconds of the signal being made; without giving you a chance to straighten out on your course and a situation as figure 7 develops.

A is the guide and promptly puts her helm over at the hauling down of the signal to go ships right 90 degrees and at 15 knots arrives at position A_1 in 40 seconds.

had for the distance to be gained from right or left of your present position.

For example, see Fig. 8. To go from B_1 to B_2 or anywhere on that line of bearing where the line parallel to the line B_1B_2 cuts the speed of the guide at A (20 knots) gives 90 degrees, but mani-

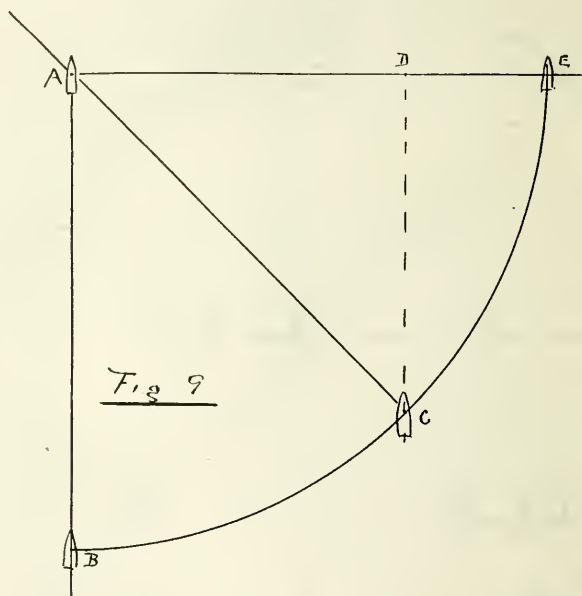


festly if you were to gain 100 yards to the right you would not attempt to turn 90 degrees and steam 20 knots but you would do it if you had to gain 5000 yards.

The speed at right angles to the course of the guide is obtained as follows:

See Fig. 8. Take for example, you have decided to slow down to 16 knots. You find the 16 knot circle cuts the line $A_1 B_3$, which

is parallel to the line B_1B_2 through the point A_1 , the speed of the guide, at F which gives a change of course of 17 degrees. Resolve the speed $A-F$ parallel to the *course* of the guide A_{15} and at right angles to the course of the guide $F-15$ and the length of the line $F-15$ measured on the scale of knots gives 5 knots, which means that when B_1 slows down to 16 knots, changes course to the right 17 degrees, she advances parallel to the course of the guide



A at 15 knots, and at right angles to the course of the guide 5 knots.

If the distance B_1K you have to gain to the right is 1000 yards, you go in the direction B_1K at the speed of 5 knots, or 500 yards in three minutes, 1000 yards in six minutes.

All of this information is obtained from the mooring board.

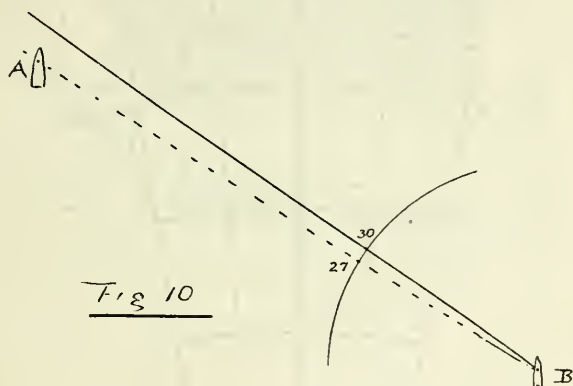
See Fig. 9. A is the guide. Remember in changing from a stern B , to a 45 degree bearing, C , the distance $A-D$ has to be gained to the right but the changing from a 45 degree bearing, C , to a beam bearing, E , the same number of degrees as before, only the distance $D-E$ has to be gained.

See Fig. 10. When keeping position in line of bearing, set the pelorus for the correct bearing, $B-30$, and watch if the correct bearing is moving ahead or astern. If moving ahead then to bring the line back on the guide, slow down.

It is important to keep to this method, as it not only tells what is to be done to regain position but gives an estimate of how many yards out of position you are.

For example; if the line cuts the jack staff, you know you are the length of the forecastle out of position, 50 yards or whatever the length of the forecastle may be.

If you depend upon the actual bearing to give you the information to keep your position and; for example, if the correct bear-



ing is 30 degrees and your bearing is 27 degrees, what to do to change 27 degrees to 30 degrees is the problem that presents itself to your mind. The temptation is to reason you have to add to your speed to go from 27 degrees to 30 degrees and many experienced officers have made that mistake.

Where does the correct line of bearing cut? Ahead of the guide brings the direct reasoning, slow down to bring the line back on the guide.

Fig. 11, a section of the mooring board, is constructed on the same principle as shown in Fig. 8, for every 10 degree line of bearing and the results tabulated. For 10 knot standard speed one knot maximum change in speed, 10 degree maximum change of course in Fig. 12.

For 20 knot standard speed, 2 knot maximum change in speed, 5 degree maximum change of course, in Fig. 13.

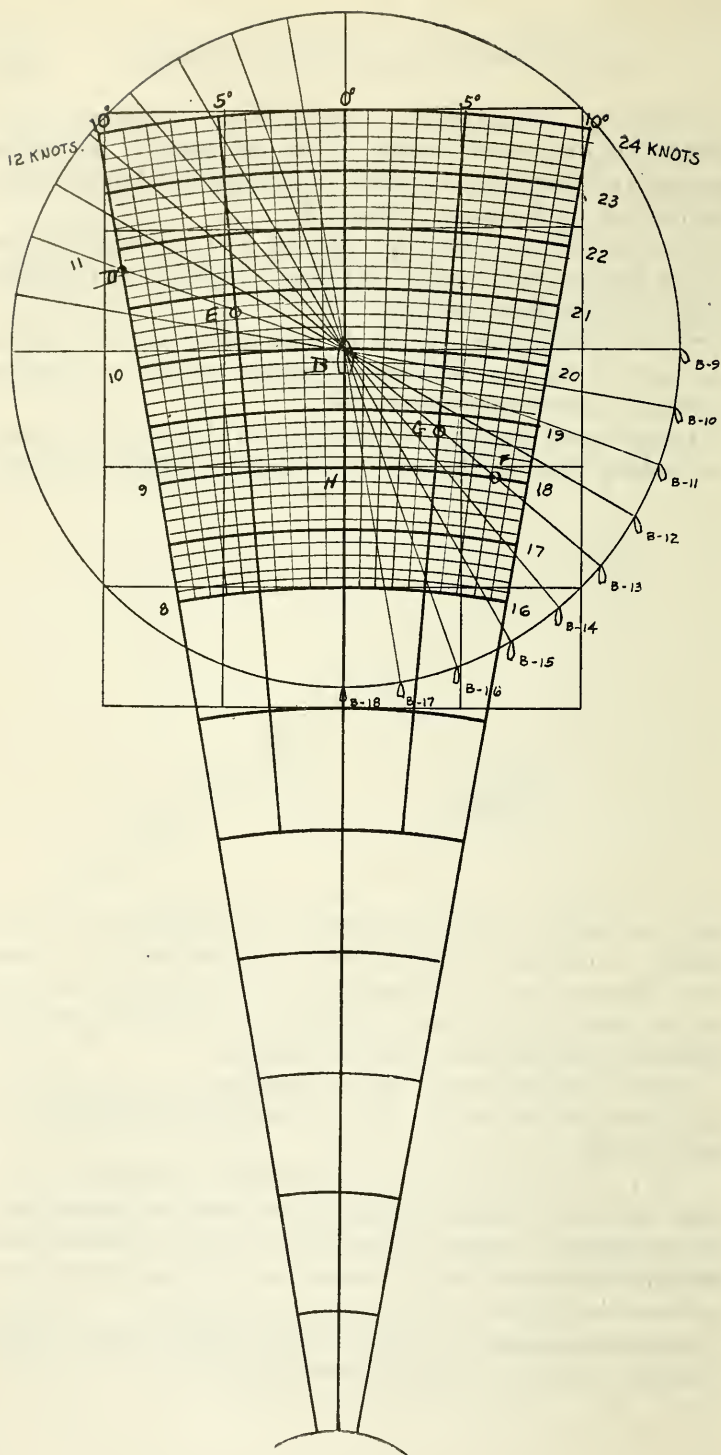


FIG. II.

The method of using Fig. 11. To go from $B-II$ to B , using not more than 10 degree change in course with 10 knot standard speed. The line $B-II$ B if extended cuts the 10 degree radius at D which is on the 10 $9/10$ knot circle; which means for a change of course of 10 degrees a change of speed to 10 $9/10$ knots.

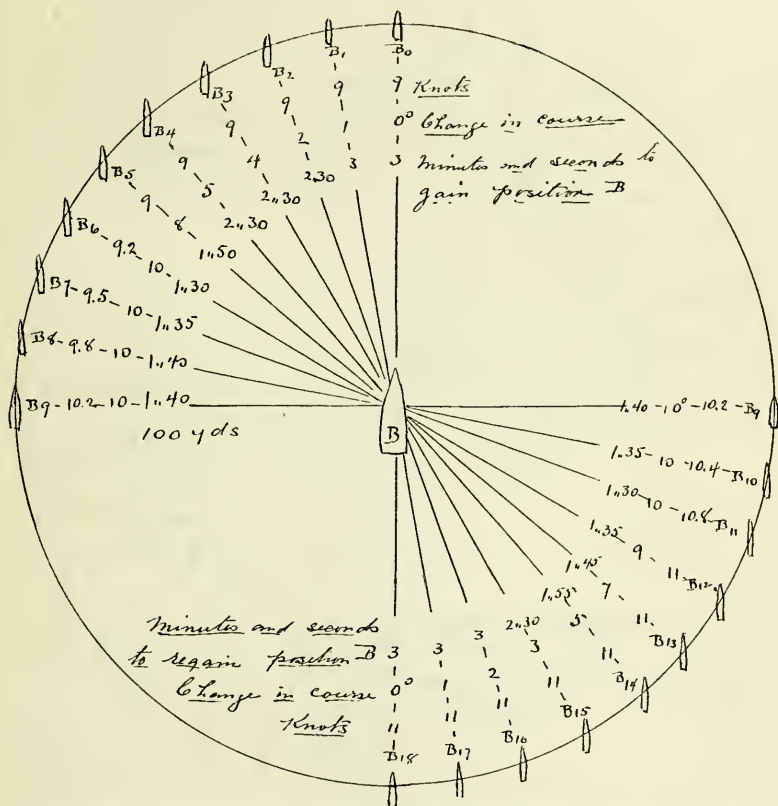


FIG. 12.—10 Knots standard speed. 1 Knot maximum change of speed. 10° Limit change in course.

If no more than 5 degrees change in course. The line $B-II$ cuts the 5 degree radius at E on the 10 $4/10$ knot circle which means for a change of course of 5 degrees a change of speed to 10 $4/10$ knots.

To go from B to B_{13} , 20 knot standard speed, not more than 10 degrees change in course.

The line $B-B_{13}$ cuts the 18 knot circle at F on the 8 degree radius and the 5 degree radius at G on the 18.7 knot circle, meaning that with a change of course of 8 degrees you change your speed to 18 knots; with a change in course of 5 degrees you change your speed to 18.7 knots.

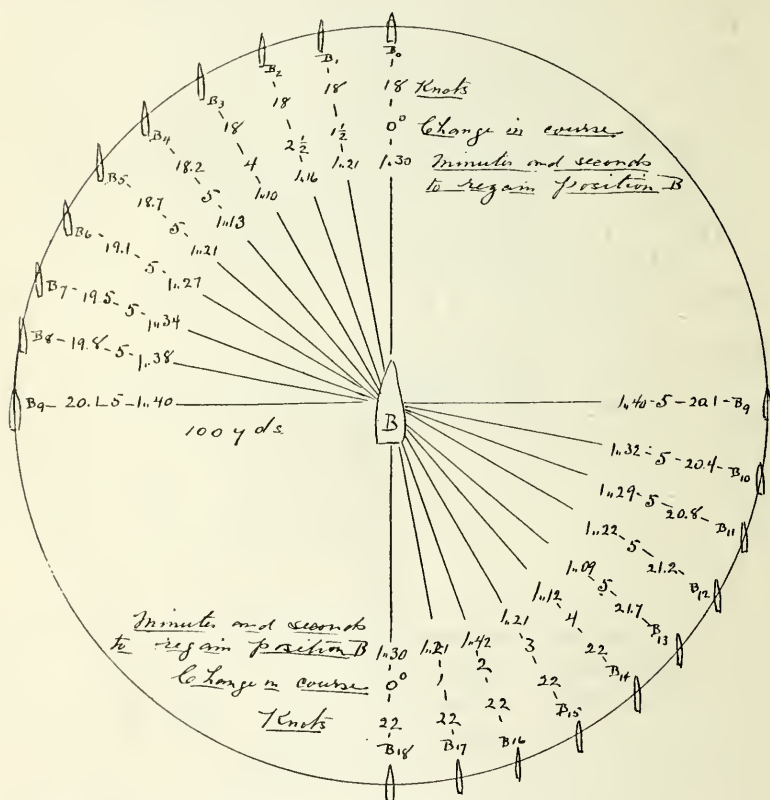


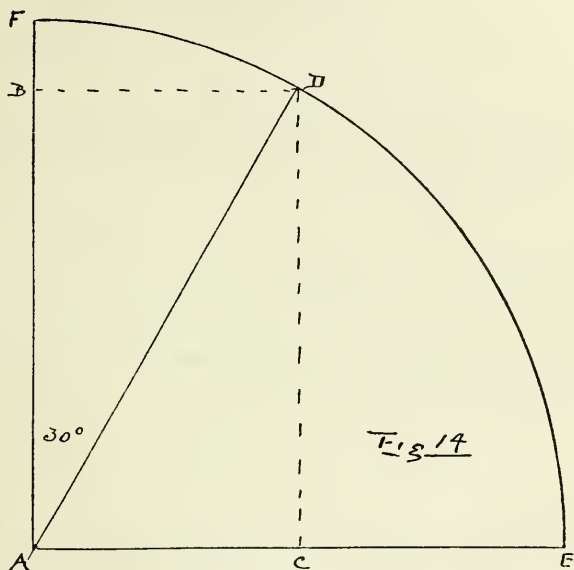
FIG. 13.—20 Knots standard speed. 2 Knots maximum change of speed. 5° Limit changes in course.

The distance of F from the vertical line $F-H$ at the scale of knots gives 2.5 knots, is the speed at right angles to the course of the guide.

Figs. 12 and 13. B is your correct position in any line of bearing and taking a maximum error of 10 degree yards and every 10 degrees on the 100 yard circle the change in speed and change in course with resulting time to regain correct position, B , is

tabulated, with the intention of impressing on you the fact that with 100 yards error of position how quickly your position is regained.

See Fig. 14. AF is the original course. AD a change of course of 30 degrees. AD resolves at right angles AC to the



original course. AF shows that you go to the right at one-half your original speed.

This means that if your speed in the direction AF is 20 knots and you change your course 30 degrees you will go in the direction AC at the rate of 10 knots.

The Nautical Eye and Nautical Judgment must be Developed Through Knowledge.

DISCUSSION

The Old Navy

(SEE PAGE I, WHOLE No. 215)

MR. M. D. HYDE.—To-day the PROCEEDINGS of January, 1921, reached me and my attention was immediately attracted to the frontispiece "The Old Navy."

At once I recognized "Old Griff," John T. Griffith.

To go back of his record as there given:

In November, 1870, I reported aboard the U. S. S. *Ossipee* in San Francisco, as a steerage officer, a midshipman. The ship was about to sail for a cruise in the South Pacific.

Most of the crew had just come from the China Station and Griffith was one of them, was the carpenter's mate, and I am quite sure he was of the China detail.

My remembrance of him is quite distinct, though 49 years have elapsed since I last saw him.

He was a tall, fine-looking man, of quiet, dignified manner and strictly temperance.

He was a "man before the mast" without a superior, and was held in the highest esteem by all the officers and men aboard the *Ossipee*.

Psychology in the Navy

(SEE PAGE 77, WHOLE No. 215)

LIEUT. COMMANDER K. C. MCINTOSH.—Some years ago the phrase "Scientific Management" ran through the navy like a prairie fire. It was on everyone's lips, and hundreds of officers talked glibly about it. The most noticeable feature of the talk was the odd fact that no two of the talkers had the same definition for the phrase. It was regarded as some new and wonderful discovery whereby the fortunate possessor of a knowledge of it could easily get nine hours work per day out of a navy yard mechanic or twenty-seven hours from a bluejacket. An omnivorous magazine reader could in ten minutes name the favorite magazine of any enthusiastic young officer by the arguments he used about "Scientific Management." One commanding officer under whom I served at that time seriously stated that "Scientific management is doing everything yourself. Never forget that!"

Meanwhile, the navy was putting into effect a few examples of scientific management—real ones; but they were not called by that name. Engineering and storekeeping competitions between ships demanded scientific man-

agement. The cost-accounting system made it possible in navy yards. Caustic inquiries from the Department to the commissary officers of ships with excessive ration cost forced their recipients to get busy and apply a little of it. The phrase dropped out of sight, but the idea, which as far as the navy is concerned was born the first time Congress cut down a naval estimate, remained. We have always had it, we have always used it to the best of our steadily increasing ability. When we lose it, we'll lose a war some day. In its last analysis, scientific management is merely making one dollar do one hundred and five cents worth of work when compared to the last previously spent dollar.

The catchword of the moment is "Psychology." Anyone can define it for you. "Science of Mind"—of course. In application, however, it is as indefinite as "Management" used to be; and the average man in conversation or writing seems to think it something brand new and esoteric, something mysterious which only the gifted can use and then only after digging into books. The grievous difference between this fad and the last is that a half-dozen watchful Bureaus were ready to crack the head of the officer who did not apply management to the spending of government money. But a not-too-well informed psychology enthusiast can work incalculable harm to the navy in a very short time, and there is little or no check on him.

There is no need to "introduce psychology into the navy" for it is there—has been there since the first war-galley slipped into the water and was conspicuous among the other tiny ships in the harbor because of her glittering scarlet paint and brass beak and well-fitting lug. Why is the salute—to impress upon the gob that the officer is a great man? No—just to remind him that men who live within eighteen inches of each other for months at a time have got to be polite to each other. Why insist upon the uniform regulations? To keep the idea firmly fixed in every man's head that he is one of the team and not an individual sea-rover. Why morning and evening colors? Not to drive home any intense regard for the particular threads of bright bunting on the halliards, but to make every man on board twice a day stand still for a moment and remember the ideals of his Service. For that matter, why are military services the only organizations in the world who cling fiercely and proudly to that word Service?

The Service and particularly the Naval Service is already a mass of applied psychology. Where trouble develops with personnel, it will be found that it is nine times out of ten the result of psychology misapplied by some one. The word itself is of new application. The thing itself is as old as the Service itself. "Get to know your men, young 'un," said the Adjutant to Dick Cottar. "Get to know 'em and they'll follow you anywhere."

When the Invincible Armada was in sight off Fastnet, there were many, even a majority of Englishmen who were terribly impressed by the psychology of that name "Invincible." The English crews were nervous and jumpy. Francis Drake never heard the word "psychologist," but he proved himself a master one. Loudly announcing that there was no hurry, "Let the wind drift 'em to loo'ard and we'll crack Don Philip's

skull!" in plain sight of the town and of the quay where his liberty parties were hastily embarking, he played tenpins all afternoon.

"Western Ocean Law," so-called was based on the psychological principle that an officer should be able to "lick every man in his division." In its new naval application of being able to show every man how to improve on his methods of doing his job, Western Ocean Law is one of the biggest helps to a happy ship we have to-day. The most of the Afterguard are young, or look so in these days; and the majority of the enlisted men have just about had time to learn how to take pride in a well-found clothes-bag. The new division officer who quickly demonstrates that he is a better plug-man, a better water-tender, a better yeoman, a better rifle-shot, a better lookout, than any man in his division, has the way smooth before him. He may not call it Applied Psychology, but that is what it is.

In little things, applied psychology is in everyday use in every ship's department which shows the slightest sign of efficiency. Captain Taylor's article on Desertion is nothing more or less than a clean-cut discussion of psychology as it is used or abused in the navy. My article on training men, which appeared in the PROCEEDINGS of February, 1919, was an attempt to briefly group a few of the outstanding psychological principles which every officer in my corps has to learn if he wants his semi-annual reports to go forward without reference to him for comment. .

Naval history is replete with stories of the kind of psychology which we need, and which, fortunately for us all, we have. "A hot place, sir; but mark you, I would not be elsewhere for thousands!" "Gentlemen, will it please you to charge?" "Keep your sword, Captain Dacres; but I'll trouble you for that hat!" "Damn the torpedoes!" and more recently, "Retire, hell! We just got here!" The "Science of Mind" resolves itself for our purposes into the "Knowledge of Men," and I am proud to say that I have had the privilege of serving under some of the foremost naval psychologists of my day. The captain who is cheered when he leaves the ship, the admiral who is rowed ashore by his officers, the division officer to whom his men bring their personal family troubles, these officers are psychologists, wittingly or unwittingly.

"Get to know your men, young 'un," said the Adjutant. He might have added, "You've got to—they'll get to know you, fast enough!" And first of all, "*Gnothi sauton.*" It pays.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 5653. New members, 226. Resignations, 62. Deaths (1): Lieut.-Comdr. W. E. Davis, U. S. N. R. F.

Membership Campaign A membership campaign is being conducted, both among officers of the regular service and of the Reserve Force. It is believed that *all officers* should support the Institute by joining. Publication costs are such that a large membership is imperative. The PROCEEDINGS are an excellent medium for keeping officers, and particularly those in an "inactive status," in touch with naval affairs.

Dues The annual dues (\$3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

Address of Members *All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.* Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 15th of each month.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147 and 173 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., February 15, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO.....	I
PUBLICATIONS, U. S. NAVAL INSTITUTE.....	(2)
SPECIAL NOTICE	464
TOPICS FOR ESSAYS.....	465
LIST OF PRIZE ESSAYS.....	467

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ANNUAL FINANCIAL STATEMENT

1. The Annual Financial Statement for the year 1920 is submitted herewith.

2. Attention is respectfully invited to the following points:

(a) The assets and liabilities shown as of January 1, 1920, are the corrected figures as determined by the committee of the Board of Control which re-audited the accounts on June 15, 1920.

(b) During the year old books, which were of doubtful sale value, were charged off from the inventory, reducing this account by about \$5800. The inventory figure is now based entirely upon live books.

Similarly, no dues of members who are now more than two years in arrears, or whose addresses cannot be found, are carried under "Dues Receivable" as assets to the Institute. About \$6000 has been charged off as bad dues in this manner. The assets carried as of December 31, 1920 are therefore reduced to property and amounts due the Institute, from which the Institute has every right to expect a return.

BALANCE SHEET FOR THE YEAR ENDING DECEMBER 31, 1920

UNITED STATES NAVAL INSTITUTE

ASSETS		LIABILITIES AND NET WORTH	
<i>Cash.</i>		<i>Accounts Payable.</i>	
Farmers National Bank...	\$26,990.84	Lord Baltimore Press	\$14,844.83
Savings banks.....	<u>20,203.24</u>	Various dealers.....	448.11
	\$47,194.08	Accrued royalty	<u>431.92</u>
			\$15,724.86
<i>Accounts Receivable.</i>		<i>Prepayments.</i>	
Dues	\$4,929.99	Dues	\$1,289.04
Subscriptions.....	36.97	Subscriptions.....	1,176.61
Advertisements.....	313.78	Advertisements.....	75.00
Miscellaneous	<u>6,895.80</u>	Miscellaneous	<u>84.73</u>
	12,176.54		2,625.38
			\$18,350.24
<i>Other Assets.</i>		<i>Reserves.</i>	
Bonds.....	\$97,640.62	Reserve fund.....	\$8,684.09
Inventory	30,436.65	Reserve bad debts	<u>560.27</u>
Prepaid royalties.....	108.23		\$9,244.36
Furniture and fixtures....	1,841.70	<i>Surplus.</i>	
Prepaid expense.....	<u>917.64</u>	January 1, 1920.....	\$171,434.50
	130,944.84	Less	
		Loss for year.....	\$4,892.32
		Bad dues	3,312.51
		Depreciation bonds.....	420.00
		Trans. reserve.....	82.50
		Trans. to overpayments ..	<u>6.31</u>
			\$8,713.64
		Total liabilities and net worth.....	<u>162,720.86</u>
			171,965.22
Total assets	<u>\$190,315.46</u>		<u>\$190,315.46</u>

TRADING AND PROFIT AND LOSS STATEMENT, YEAR ENDING DECEMBER 31, 1920

<i>Trading.</i>	<i>Extra Publications.</i>	<i>Purchased Books.</i>	<i>Proceedings.</i>	<i>Totals.</i>
Sales	\$43,878.15	\$1,939.95	\$533.44	\$46,351.54
Purchases	\$40,351.06	\$1,905.61	\$21,364.57	\$63,621.24
Inventory, Jan. 1, 1920...	15,072.82	\$1,905.61	\$21,364.57	15,072.82
	\$55,423.88	230.00		\$78,694.06
Inventory, Dec. 31, 1920...	30,206.65		21,364.57	30,430.65
Cost of sales.....	25,217.23	1,675.61	\$20,831.13	48,257.41
Trading loss	\$18,660.92*	\$264.34*		\$1,905.87
* Gain.				
<i>Operating Expense.</i>				
Postage.....			\$1,678.99	
Advertising.....			787.14	
Board meetings.....			1,342.24	
Prize essays			400.00	
Office expense			1,311.43	
Salaries			10,936.31	
Auditing.....			200.00	
Contributors.....			4,373.95	
Express and hauling.....			510.82	
Insurance.....			28.42	
Discount.....			45.62	
Envelopes for Proceedings.....			586.25	
Royalty.....			5,113.70	
Gift (Wilkes Memorial).....			100.00	
Depreciation in furniture and fixtures.....			64.00	
Operating loss				27,478.87
				\$29,384.74
<i>Miscellaneous Income.</i>				
Advertisements			\$3,479.61	
Binding.....			115.40	
Interest.....			6,608.36	
Subscriptions			3,060.53	
New members			413.24	
Sundries.....			87.79	
Dues			10,727.49	
Net loss.....				24,492.42
				\$4,892.32

CHANGES IN NET WORTH, YEAR ENDING DECEMBER 31, 1920

<i>Assets</i>	<i>January 1, 1920*</i>	<i>January 1, 1921</i>	<i>Increase</i>	<i>Decrease</i>
Cash Farmers National Bank.....	\$33,109.43	\$26,990.84	.....	\$6,118.59
Cash savings banks.....	19,535.38	20,203.24	\$ 667.86	.....
Dues receivable.....	9,237.56	4,929.99	.....	4,307.57
Subscriptions receivable.....	60.25	30.97	.....	23.28
Advertisements receivable.....	354.20	313.78	.....	40.42
Accounts receivable.....	9,401.48	6,895.80	.....	2,505.68
Investments.....	98,060.62	97,640.62	.....	420.00
Inventory of Institute books.....	15,072.82	30,206.65	15,133.83	.....
Inventory of purchased books.....	.....	230.00	230.00	.....
Prepaid royalty.....	200.00	108.23	.....	91.77
Furniture and fixtures.....	1,556.00	1,841.70	285.70	.....
Prepaid expense.....	446.17	917.64	471.47	.....
			<u>\$16,788.86</u>	<u>\$13,507.31</u>
<i>Liabilities</i>	<i>January 1, 1920*</i>	<i>January 1, 1921</i>	<i>Decrease</i>	<i>Increase</i>
Accounts payable Lord Baltimore.....	.....	\$14,844.83	.....	\$14,844.83
Accounts payable miscellaneous.....	\$256.44	448.11	.....	191.67
Accrued royalty payable.....	2,542.05	431.92	\$2,110.13	.....
Prepaid dues.....	969.38	1,289.04	.....	319.66
Prepaid subscriptions.....	996.39	1,176.61	.....	180.22
Prepaid advertisements.....	.....	75.00	.....	75.00
Sundry overpayments.....	1,508.02	84.73	1,423.29	.....
Reserve fund.....	8,444.09	8,684.09	.....	240.00
Reserve for bad debts.....	883.04	560.27	322.77	.....
			<u>\$3,856.19</u>	<u>\$15,851.38</u>
Totals.....			<u>\$20,645.05</u>	<u>\$29,358.69</u>
Decrease in surplus (see balance sheet)			8,713.64	.....
			<u>\$29,358.69</u>	<u>\$29,358.69</u>

* Found correct by re-auditing committee, June 15, 1920.

Audited and found correct.

T. L. JOHNSON,

Captain, U. S. Navy.

E. J. KING,

Captain, U. S. Navy.

B. C. ALLEN,

Commander, U. S. Navy.

Auditing Committee.

Approved by the Board of Control February 14, 1921

H. K. HEWITT,

Commander, U. S. Navy,

Secretary and Treasurer.

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.	
NAVAL POLICY.	
MATÉRIEL.	
PERSONNEL.	
MERCHANT MARINE.	
AERONAUTICS	431
ENGINEERING	436
RADIO	441
MISCELLANEOUS	442
CURRENT NAVAL AND PROFESSIONAL PAPERS.	446

FRANCE

THE FRENCH NAVAL YEAR.—Waste and stagnation sum up the 1920 naval year so far as new construction and sea training, that is to say, actual fighting efficiency, are concerned. Poorly-designed cargo boats and liners absorbed the main attention of state dockyards to the detriment of the navy and also of the rate payers, showing, in wasted millions, the beauty of socialistic methods and of government by the unfit. Next, a swarm of nonmilitary *aviso*s of 850 tons, *canonnières* of 500 and 650 tons—*poussière navale* of the worst kind, able neither to fight nor to run, the designs of which, hastily improvised under pressure of hostilities, ought to have been dropped at the Armistice if due consideration had been given to the national interest—have occupied, and are yet occupying in a leisurely manner most of our private dockyards, to the cost of over a hundred million francs, which, invested in bona-fide warships, would have meant substantial additional strength. The modified 1000-ton destroyer *Enseigne-Gabold* (*Normad*) is not yet completed. Progress accomplished in England, Italy, and America in that line of construction depreciates her value, and renders her to a certain extent obsolete. Ex-Boche cruisers and destroyers incorporated in the fleet have been so badly *sabotés* as to represent a costly and doubtful acquisition.

In the submarine line, the last of the *Fulton* class of 870-1270 tons have joined the flotillas after successful trials, or are undergoing their final tests. Several units of the *Amaranthe* series have been fitted as minelayers, while the small *Creusot* boats (*O'Byrn*, *Fournier*, *Dupetit-Thouars*) of the *Laubeuf* design are ready. The minelaying *Chailley* (Normand-Fenaux plans) and *Callot* (Bordeaux) are approaching completion. New and larger boats were ordered a few months since at Cherbourg and Toulon. Much headway had been made in the creation of a bombing aerial fleet, whilst lack of personnel and funds, together with neglect in direction, have caused a hundred of new machines to go to waste. On the whole, when are considered the progress accomplished in rival navies, the *Marine Française*

is seen to have been retrograding in the course of the last year, especially remembering that deep discouragement prevails among the personnel of officers and non-commissioned officers; that ignorance of the lessons of history has made up crews with anarchistic workmen; that lack of reliable specialists in sufficient number (together with the amazing manning mutations that transfer officers and men from one ship to the other, every few weeks or every few months) baffles the efforts of patriotic commanders towards a resumption of bona-fide war training.

This is a gloomy picture indeed, and verbal optimism cannot alter facts. The future, happily, is more promising, as 1921 is to see new construction and rational training in full swing. Concrete benefit is to be derived from the substantial work accomplished in the field of invention. Two experimental guns of 450 mil., with 1500-kilo shells, designed by General Charbonnier, are to be tested some eight months hence. They mark a new departure in several important respects, and an advance on what is known to have been realized in England and the States with the 18-inch caliber. Should circumstances and the success of the experiments now being made with unsinkable hulls lead France to lay down her projected battleships in 1922-23, the fine 16-inch American dreadnoughts would be rendered well-nigh obsolete and outranged, and France would leap anew to the fore. Calibers will decide in artillery contests, and, with the coming changes in powers of offense and defense, it pays to wait; such, at least, is the contention of those who overlook the factor Time and take it for granted that no war will burst out before France is in a position to face it. With regard to the armament of projected light craft, it has been judiciously and officially recognized that henceforth the 4-inch caliber is too weak for destroyers, and similarly that the 5.5-inch weapon, though excellent, no longer meets cruiser requirements, and must be replaced by 7.6-inch and even 9.4-inch (light) guns if French *croiseurs légers* are to be a paying investment. The U. S. S. *Omaha* (twelve 6-inch guns), for instance, may be efficiently armed to fight destroyers, but they would have a very poor chance against the British *Raleighs* (seven 7.5-inch weapons) that fire shells about twice as heavy, and would hopelessly outrange them. As speed must combine with caliber to make fighting worth, and as, on the other hand, the Rue Royale authorities are alive to the importance of superior quality for the reduced fleet of the republic, the question of motors is being studied in close co-operation with private firms. It has been decided, on a request by the Commission de la Marine, to commence or order in 1921 no fewer than 36 submarines of 1200 and 600 tons, to be constructed at Toulon, Cherbourg, Rochefort, St. Nazaire, Bordeaux, Rouen, and La Seyne. For the first time the bulk of the contracts will go to private industry; hence quicker delivery and better work. Mons. Landry is credited with the intention of utilizing the healthy spirit of emulation that prevails among private constructors and *ingénieurs de la marine*. If so, a new era will open for the French underwater fleet, that has had so very much to suffer from the glaring incompetence of the Section Technique, as well as from the inefficiency of state arsenals, that require several years to complete submarines of a few hundred tons.—*The Naval and Military Record*, Jan. 12, 1921.

PROSPECTS IN NAVAL AVIATION.—This year is to see strides in naval flying. The many obstacles that lay across the route of aerial progress are being gradually removed; the number of young officers taking to aviation is daily increasing as the result of ministerial encouragements to the new branch; and our leading flag officers, although themselves partial to the mighty armorclad, king of the ocean, no longer shut their eyes to the fact that superiority in the air is the one point of vantage which lies within the reach of France, in the present state of her finances, and that would enable her to fully utilize her remarkable strategic assets. There appears, up to the present, to be a wide difference between the French and the British ways

of looking at the air problem, although ultimately the French organization may come to resemble the British, the latter being better adapted to naval needs. Here, as in England, naval flying is realized to be yet in the experimental stage. Seaplanes are so fragile and so short-lived that it would be a mistake to construct, at heavy cost, too many machines of a given type, that would risk being obsolete in a very short time, though the advent of the armored all-metallic machine—and here France, being the richest aluminium producer in Europe, will have a substantial advantage—will by degrees cause the aerial fleet to rank on the same footing with ordinary ships in the matter of longevity.

Therefore the French policy aims at constituting an air wing made up of three successive *echelons*: (1) *Flottilles de combat* at all times ready for instant action in co-operation with the fleet and comprising a limited number of up-to-date machines of the various types manned by thoroughly efficient specialists; (2) *flottilles de reserve*, composed of commercial machines (and dirigibles) designed with a view to easy transformation to war use, and manned by naval reservists employed in the over-Channel or over-Mediterranean lines of aerial transportation; (3) *flotilles d'entrainement et de mobilisation*, that will have their headquarters in St. Raphael-Toulon and in the other ports militaires, and would be made up of older machines only fit for coastal duties and also of the latest models, the wholesale construction of which would start at the first threat of war, to be manned by the skilled personnel of the *écoles d'aviation* and by the numerous recruits and volunteers ever in training. The latter mobilization force, besides being available for special missions, would be available to fill the gaps made by casualties in the *flotilles de combat*. An arrangement of this sort would satisfy both the interest of efficiency and of economy. Hence the decision of the Admiralty to eventually "subsidize" and, to a certain extent, control the Marseilles-Algiers, Marseilles-Oran, Marseilles-Tunis, Toulon-Corsica-Bizerta, and Bordeaux-Morocco projected passenger and goods lines. Aerial traffic between France and her colonies is to be the monopoly of French lines, and, considering the unique position of France on one side, and of thriving Algeria, Tunisia, and Morocco on the other, Frenchmen are seen to have every reason to try to possess the most important aerial force in the Mediterranean, though Great Britain, with the London-Paris-Marseilles-Malta-Egypt route (which growing speed and radius of action will make a reality within the next few years), will be a dangerous competitor in the Mediterranean aerial rivalry.

It may be taken for granted that true efficiency in naval aeronautics is to be sought in close and permanent co-operation with military and civilian aviation. Like the sea, the air may be said to be all one; and Minister Landry has rendered his country a service by throwing down the watertight walls which red tape had erected between the several aerial administrations. Thus, he has just placed at the disposal of the *Sous-Secretariat de l'Aéronautique* 10 *officiers de vaisseau*, 12 *ingénieurs de la marine* and about 30 other officials, which means that henceforth the navy is to directly benefit by the comprehensive experimental work conducted under the auspices of the Air Ministry, which is responsible for the creation of a powerful air fleet for peace and eventually for war use. To that end no less than 185,000,000 francs is to be spent in 1921, of which 28 million francs is for subsidies to aerial lines, 9 million francs for the construction of four rigid dirigibles, 18 million francs for dirigible ports, 24 million francs for enlarging training centers, one million francs for seaplane experiments, etc. This in addition to aviation credits in the Marine Budget.—*The Naval and Military Record*, Jan. 19, 1921.

GREAT BRITAIN

IMPERIAL STRATEGY AND A COMBINED STAFF.—The debate initiated by Lord Haldane in the House of Lords on May 5, following on the publica-

tion of various letters and articles in the press, shows that public opinion is becoming interested in a subject which is of vital importance to the future of the Empire and one which has been exercising the minds of officers of all three services during the past two years, namely, the control of Imperial Strategy.¹

2. At the same time, after reading recent expressions of opinion, both service and civilian, it is impossible to avoid feeling that the wide diversity of view evidenced is to some extent due to the various writers and speakers having in mind organizations and functions which are by no means identical. This view is strengthened when one observes that the organization under discussion is indifferently referred to as an Imperial General Staff, a Ministry of Defence, or a combined staff, and its functions outlined by different speakers on the same occasion in the following terms:—
(a) Distinguished general officers who direct and influence the activities of the special staffs of the forces; (b) in place of the Committee of Imperial Defence presided over by the Prime Minister, a Minister of Defence, supreme over all the services, directing military policy in regard to the future with the aid of the new Imperial General Staff; (c) an Imperial War Cabinet; (d) a staff to control naval, military or air operations.

3. It seems possible, therefore, that a short discussion of the various principles underlying the conduct of imperial strategy and the organizations now in existence for carrying them into effect may lead to a clearer understanding of the changes which a large body of military opinion to-day considers necessary.

4. First of all; what in general terms are the functions required of those organizations charged with the control of Imperial Strategy?

These are as follows:

A. *In Peace*.—(i) To consider all world situations which may necessitate the employment of armed force, to work out the strategic measures by which such situations can best be met and the forces required for the successful conduct of operations should peace strategy² fail to produce a favorable settlement.

(ii) To collect, sift, and assimilate all forms of intelligence which may be of value in determining the direction which should be given to imperial policy in peace and the strategy which should be adopted in war.

(iii) To consider and work out the organization and system of training of the forces of the Crown which will best meet the requirements of campaigns under the varying strategic, tactical, and climatic conditions which are foreseen as probable.

(iv) To ensure that the orders of the chief, under whom the particular staff functions, are duly executed.

B. *In War*.—(i) To consider the strategy which should be adopted.

(ii) To collect, apply, and disseminate intelligence.

(iii) To advise the commander under whom the staff acts.

(iv) To ensure that the orders of that commander are duly executed.

5. We thus arrive at two distinct conclusions:

(a) That both in peace and war the work of a staff is in the main contemplative and advisory, and only in one respect executive.

(b) That the problems which staffs are called upon to study vary in scale from those involving a review of the whole world to those concerned with one particular area only; that the forces with which they are called upon to deal vary from those of the Empire to those engaged in one

¹ The term "Imperial Strategy" (Imperial Defence is a misnomer) is used in this article in the widest sense, covering the examination in peace time of all problems which may affect the future safety of the Empire, diplomatic or other peaceful action necessary to secure that safety, and, in war, the control of operations undertaken with the same end in view.

² Peace strategy includes diplomacy, economic pressure, formation of alliances, etc.

particular theater of war; that the intelligence which they have to assimilate varies from that of world-wide scope, and often only indirectly affecting naval or military strategy (*e. g.*, information as to foodstuffs, raw materials, merchant shipping), to the local information required by a commander in a particular campaign. Speaking generally, however, the above duties fall into four categories:

(i) Those concerned with the security of the Empire and with the forces of the Crown as a whole.

(ii) Those dealing with the combined action of the navy, army and air force of the United Kingdom.

(iii) Those concerned with the organization, training, etc., of one service alone.

(iv) Those concerned with the conduct of operations at sea, on land, or in the air, where the action of one service alone is involved.

Although these four categories will often overlap, none the less it seems clear that their characteristics are sufficiently distinct to necessitate the existence of separate bodies, each suitably organized to carry out its particular task.

6. Having now ascertained the principles in relation to imperial strategy to which effect has to be given, let us next consider the bodies which exist to-day for that purpose and the extent to which they fulfil their rôle.

There are today:

(i) The Committee of Imperial Defence.

(ii) The departmental staffs of the Admiralty, War Office and Air Ministry.

(iii) In war, the staffs of commanders-in-chief at sea, in the field, and perhaps in the air.

7. The Committee of Imperial Defence is presided over by the Prime Minister, and consists of such statesmen as he may call in to discuss any subject under consideration. Members of Dominion Governments when in England may also attend its meetings. It possesses a small secretariat charged with the duty of collecting information and securing continuity of policy. The committee meets at varying intervals, but works mainly through sub-committees. To its meetings, or those of its sub-committees, are summoned the heads of the fighting forces in the Admiralty, War Office or Air Ministry, when matters affecting their departments are under consideration.

The committee is thus essentially political, altering its composition with each change of government, hearing expert witnesses, but allowing them no opportunity of influencing decisions by the recording of their vote. Valuable as has been the work done by the committee it suffers from certain inherent defects.

(i) Its president and members are men already overburdened with duties of state.

(ii) Its meetings are only held at comparatively rare intervals, and then for the discussion of a particular question only. In the intervals between its meetings, continuity of policy is only secured by the secretariat, which has neither authority to act on its own initiative, nor would be a suitable body to which to entrust any power of decision. Consequently, there is a lack of continuous effort, an absence of long thought out and well matured policy, and questions often reach an acute stage before they are dealt with; with the result that hasty decisions, not always perhaps those which would have been arrived at after fuller consideration, are taken, or a decision is delayed in a matter in which early action is of importance until the question at issue shall have been threshed out.

(iii) Expert opinions laid before the committee—which, again, be it noted, is composed of politicians—are generally based on a purely departmental view of the situation; that is to say, the soldier expresses the military view, the sailor the naval one, and so on. It is then left to a purely civilian body to decide what weight should be attached to the technical objections

raised by naval experts to the proposals put forward by the military authorities and *vice versa*, to consider the merits and demerits of alternative schemes in the face of these objections, and, finally, to take decisions of the greatest moment and often involving the overruling of the views held by one or other of the service experts. How grave may be the results which will follow on such a decision the report of the Dardanelles Commission illustrates.

The responsibility of deciding between the views of service experts is one which should never be thrown on any body of statesmen if it can possibly be avoided, and with a sound staff organization the occasions when it cannot be avoided should be extremely rare.

(iv) Proposals laid before the Cabinet are rarely, if ever, thoroughly threshed out in detail jointly by navy, army, air force and other departments involved (*e.g.*, Ministries of Shipping, Transport) before they are brought forward for decision, or if so considered, then only by committees or conferences summoned *ad hoc*, composed of men who perhaps meet for the first time, or who at best do not know each other intimately, and who consequently are inclined in practice, perhaps insensibly, to take up a defensive attitude in favor of the proposals put forward by their own departments, and to underrate the objections raised on the part of the other services.

(v) The Committee of Imperial Defence is not truly Imperial, since members of Dominion Governments are rarely available to take their places at its meetings, and there are no Dominion officers of sufficient standing permanently located in this country to represent the views of their government.

8. Departmental staffs of the Admiralty, War Office and Air Ministry deal with plans, intelligence, organization and training almost entirely from the point of view of their own service. As a result, insufficient regard is paid, in considering these problems, to the capabilities and limitations of other services, and insufficient weight is given to such factors as transportation and the like which have a very real bearing on these matters; there is much overlapping in the matter of intelligence, for each department is served by its own intelligence service, although the bulk of the information collected is of common use and only a small portion of value to one particular service alone; the system of organization and training of any particular service, with which are so intimately bound up its limitations and capabilities, are little understood by the other services; personal contact is lacking, and that co-operation which is induced only by intimate knowledge of each other's habits, methods and personality is consequently absent.

9. In war at sea, on land or in the air, we have the naval, military or air staffs of commanders-in-chief as the case may be.

Although such staffs serve their purpose when operations are of a purely naval or military nature, it is when we come to consider operations in which two or more services are acting in combination that we find the situation unsatisfactory. Each staff works separately under its own commander. A hard and fast division of duties, rigid demarcation of spheres of action (*e.g.*, high-water mark in the case of landing operations) and the like have to be enforced, not because they best suit a particular situation, but because the two staffs do not work as one staff, do not use the same terms, are not accustomed to see things with the same eye--because, in short; they can, with the best will in the world, only co-operate by rule of thumb, by the letter of the law. How real is this rigidity and how vitally it may affect the success of combined operations is well known to all who have taken part in such operations either in peace or war.

10. Reverting then to paragraph 5, we find that there are now in existence bodies which in greater or lesser degree deal with:

(i) Imperial strategy; but only in a limited degree.

(iii) The organization and training of each service individually.

(iv) The operations of naval, military, or air forces acting alone; but none to meet the requirements of (ii) combined operations.

11. What, then, are the changes in organization which are necessary to secure the successful execution of the four categories of staff duties mentioned above?

All such changes in organization must be based on four axioms:

(i) That the making of war is as much an act of government as the conduct of peace strategy.

(ii) That, having regard to the geographical conformation of the British Empire, every operation of war viewed in its broadest aspects must be a combined operation.

(iii) That our strategy must be imperial.

(iv) That to ensure successful staff work, full value must be assigned to the personal equation.

12. Let us now apply these axioms.

(i) Since the policy of peace and war is an act of government, its control must be in the hands of statesmen and not of sailors, soldiers, or airmen as such. So far a Cabinet Committee meets requirements. On the other hand, statesmen before making decisions must have at their disposal the best expert opinion available. It is in this respect that the effect of axiom (ii) that every operation of war in its broadest aspect is a combined one at once makes itself felt.

(ii) Assuming for the moment air force co-operation with both navy and army to be a matter of course, it is clear that the degree of combination between these two latter services will vary in every individual situation. In one case the army may require the navy's co-operation only indirectly in matters of transportation, maintenance of sea communications, keeping open trade routes and the like; in another, as in the Dardanelles campaign, it may require the very closest tactical support; while at the other extreme in a campaign where the main objectives are naval it is the navy which would require the co-operation of the army in seizing and holding advanced bases necessary for the successful prosecution of maritime operations.

Whatever form, however, this co-operation may take under varying conditions, the main point to note is that in every case naval and military requirements must be to some extent antagonistic. It is no use a soldier selecting a theater of war in which to operate if the navy cannot transport the necessary forces thither in safety nor maintain sea communications open. It is equally useless for a sailor to insist on landing military forces at a spot which is ideal for the purpose if military operations cannot be developed thence. In short, the strategy of combined operations is one of the rare instances where compromise is, generally speaking, not only necessary but desirable. It therefore comes to this: In order that statesmen may be enabled to adopt the wisest imperial policy in peace and the soundest line of strategy in war, they must receive expert advice tendered, not by departmental heads of the services and based on the requirements of the service which they represent, but by a single mouthpiece and based on the mature consideration of the best brains of all three services working in conjunction. Whether this mouthpiece be a minister of defence, the chief of a combined general staff, or a written memorandum jointly drawn up by the chief representatives of each service on that combined General Staff, is a matter of secondary importance. The vital point is that the advice tendered should be the outcome of combined deliberation, that alternative proposals put forward should represent the advantages and disadvantages of each from the point of view of all three services, and not, as is apt to be the case at present, take the form of one scheme favored by the navy because it provides conditions ideal for naval operations, and another adopted by the army because it best fulfils military requirements. In short, no proposal considered impracticable by one or other service should be put forward to the government as a suggested basis for combined operations, but only those which all three are

prepared to accept as feasible. It then only remains for the cabinet to adopt that which, when regarded from a wider viewpoint than that bounded by the horizon of naval or military advantages and disadvantages, appears most likely to ensure the successful prosecution of imperial strategy.

In this respect there is no room for doubt that our organization of to-day completely fails to carry out its rôle.

(iii) Strategy must be imperial; therefore the General Staff which is to advise in regard to it must be imperial; it has to deal with problems affecting the Empire as a whole, therefore it must consider the forces of the Empire as a whole. Here at once arises a difficulty. The Dominions reserve, and always will reserve, to themselves the right to dispose of their forces in peace and to organize them primarily for local defence; even in war their employment for imperial purposes can only be reckoned on subject to the consent of the Dominion Government given when the emergency arises, a consent which, fortunately for the Empire, is never likely to be withheld if the cause be a just one.

Since therefore responsible Ministers of the Dominions cannot spare the necessary time regularly to attend meetings of the Cabinet or Committee of Imperial Defence, but can only be present on rare occasions to discuss matter of first importance, and usually when these have reached an acute stage, it is all the more necessary that their views should be continuously represented and problems affecting them considered by representatives on an Imperial General Staff in whom they have confidence; for only if the Dominions are so represented, only if they feel assured that their side of the picture has been made perfectly clear by men who know the situation thoroughly, only then will they be willing to accept a policy based on the recommendations of that staff. At present Dominion problems are worked out at home by British officers, or in the Dominions by Dominion officers, without the possibility of close personal touch, and with the meager assistance afforded by official correspondence as the sole method of securing co-operation. As a result, Dominion Governments are inclined to view any policy proposed from England with suspicion and to prefer proposals put forward locally as more likely to fulfil the requirements of their country, though perhaps far less satisfactory when regarded from the point of view of the Empire as a whole.

(iv) Successful combination depends on due recognition of the importance of personality. It is perhaps little realized by the general public how large a factor in staff work the personal equation plays. Yet there is no more noticeable feature, both in peace and war, than the increase in efficiency attained by a staff when the individual members have worked together for some time, have learned each other's idiosyncracies and habits and have begun to work, not as individuals, but as a team. The case of the different services working in combination is exactly parallel. Each has its own habits and methods of doing things, each has its own language, each at first looks on the other with suspicion. Only, therefore, by continuous personal contact can that close co-operation between individuals and between the services be attained which is the essence of success in the consideration of problems of combined strategy or the conduct of combined operations of war. Interdepartmental committees, conferences and similar fortuitous meetings for the discussion of a particular question can never produce sufficiently close unity of thought. Members of these committees, etc., meet as representatives of their departments to urge the views of those departments, and not as individuals striving towards a common goal. The Plans Department of the Admiralty and the Operations Directorate of the War Office may consult each other officially a hundred times in regard to a problem, may hold conferences and appoint committees, but the results achieved under such conditions never approach in value those which would follow in a far shorter space of time on the labors of three or four men who had worked together

previously and knew each other well. In short, in combined staff work, and no less in imperial staff work, the personal equation is everything.

13. Finally; what definite conclusions can be drawn from the above discussion?

(i) The direction of imperial strategy demands:

(a) A body of statesmen with whom must rest the final decision as to the policy to be adopted. The more imperial the composition of this body, the more universally will its decisions be accepted throughout the Empire. Whether such an end be attained by the creation of an Imperial Council in England, by following Mr. Watt's suggestion "that Great Dominions would do well to keep responsible Ministers at the seat of Empire Government," or by other means which have been suggested, is beyond the scope of this article to discuss. What we must aim at is an increased measure of imperial control in matters affecting the Empire.

(b) In place of the secretariat of the Committee of Imperial Defence an expert body, comprising the best brains to be found in the forces of the Crown; a body which has learned to work as a team; a body which will continuously and systematically contemplate the world situation as it affects the well-being of the Empire, and which by "thinking ahead" will be prepared at any time to tender the combined opinion of the three services as to the best method of dealing with situations which arise or are foreseen as likely to arise; a body which in war shall supply the Cabinet with the best advice obtainable as to the strategy of combined operations, taking into account the requirements and limitations of all three services; a body which shall secure co-ordination in the conduct of all such operations; a body which shall speak "with one set of lips."

(ii) Combined operations of the three services require a combined staff to secure their successful development. This does not mean that the naval commander-in-chief should serve under the military or air force commander-in-chief, or *vice versa*. Each has his own sphere of command, each has his own rôle to carry out. What it does mean is that the staff duties of the three services, which in such operations are interwoven to an extent perhaps little realized, must be carried out by men who know each other personally, who understand the habits, ideas and language of the sister services intimately, and who consequently work towards a common goal as a team, but each keeping his own place in the field, without friction or misunderstanding. Only if such a system be introduced can that "rigidity" which has so much hampered combined operations in the past be obviated.

(iii) The organization, training and equipping of the three services in such a way as will best fit them to carry out the policy of the government are the functions of the staffs of those services. No comment on this conclusion would appear to be necessary other than to say that in such matters an imperial organization, system of training and method of equipping should be aimed at, were it not for the fear expressed by naval writers that the existence of an Imperial General Staff would interfere with the control of the Admiralty over naval forces in these matters. Such a fear is groundless. The function of the Imperial General Staff is to advise the government as to the policy which will best meet the requirements of the Empire. The function of departmental staffs is to train, organize and equip their respective services to fulfil these requirements. The division of duties is clear cut and well defined, and there should be no cause for overlapping or mutual interference.

(iv) We have to consider the executive functions of the staff in war. It is this aspect of the Imperial General Staff which the navy views with the greatest suspicion. This suspicion appears to be based on the fact that the Admiralty, unlike the War Office or Air Ministry, actually controls operations of war. The centralization of command in the navy, made possible by the advent of wireless telegraphy, allows the Admiralty to act the part of "Supreme Command" in regard to naval forces. The

War Office, on the other hand, owing to the different conditions which prevail in land warfare, can never interfere with the discretion of a commander-in-chief in a theater of war beyond laying down the general policy to be adopted. In short, the difference is this: The Admiralty in certain cases exercises executive command, War Office and Air Ministry do not. None the less the dread of interference by the Imperial General Staff with the executive control of the Admiralty over fleets at sea is baseless. The functions of the Imperial General Staff would in no case extend to the issue of executive orders to the fleet or, for the matter of that, to land forces. Does any advocate of the Imperial General Staff contemplate the issue by that staff of orders to the commander-in-chief of the fleets in home waters to move out to attack the enemy fleet at a certain hour, or to a commander-in-chief in a theater of war to attack the enemy on a certain day on such and such a front? I trust not. No, its executive functions would be limited to the issue of "*directives générales*" (to use a French expression which is exactly opposite but has no parallel in our vocabulary) laying down the general objective of the combined operation and the measures necessary to secure co-operation between the three services. It would then rest with the departments concerned to decide upon the actual forces to be employed, and finally with the combined staff of the naval, military and air force commanders to carry out the detailed arrangements for the operation.

Under such conditions there would be no risk of interference by the Imperial General Staff with the executive control of the Admiralty in combined operations, and still less in operations in which the navy was alone concerned.

14. Such, then, in outline are the principles underlying the direction of imperial strategy, the organizations existing at the present time to carry them into effect, and the main alterations which appear necessary to provide for the security of our Empire in the days which lie ahead.

To-day we stand on the threshold of a new world wherein the old order changeth, giving place to new; well-known landmarks of the past have disappeared and new and as yet unrecognized ones are looming through the mist ahead. To-day, therefore, it behooves us to break down all vested interests, to cast aside all shibboleths and look reality in the face. What is our common aim? There can be but one answer—security of Empire. What matter then if Admiralty be degraded or other departments shorn of some of their present power? Surely no matter at all if thereby we save the state. What, after all, are Admiralty, War Office and Air Ministry but a name, a sentiment? Transfer the best of the brain power which these departments now absorb to an Imperial General Staff where each service is still master in its own house, but all three work together in unison for the common cause, and what does any one of the three lose? Nothing. The prestige of Admiralty, War Office or Air Ministry is unimpaired; it is merely transferred to another sphere.—*Journal of the Royal United Service Institution*, November, 1920.

THE ADMIRALTY AND RESEARCH.—It has in the past been a matter for reproach that the military services showed themselves slow to appreciate the great potential value of research, and of the economy which must eventually result from the expenditure of a reasonable sum on scientific investigation. There can be no doubt of the value of research when well directed, since we have before us, as instances, the completely equipped and well-staffed laboratories of many American engineering, scientific and industrial firms, whose experience is that the results of one important discovery are capable of defraying the whole cost of the research establishment for many years. Appreciating this fact, the Board of Admiralty decided, many months ago, that a research department was a necessary part of the scientific organization of the Admiralty, and decided to establish it near the National Physical Laboratory. In this new building, which, it is hoped, will be completed and occupied by the spring of next

year—1921—will be concentrated a large proportion of the scientific research on physical subjects, which has to be undertaken in order that the elucidation of the problems which are confronting the navy may be continued, and in order that Great Britain may not lag behind other countries in the application of the latest scientific discoveries to the needs of defence. The work will be under the immediate direction of Mr. F. E. Smith, F. R. S., whose appointment as director of scientific research to the Admiralty has recently been announced.

This appointment, it is to be noted, does not affect the organization or conduct of existing naval experimental stations, but rather supplements them, for it is admitted that departmental experts, though often having many years of specialized training and experience behind them, are not in the best position to realize and adapt to their own needs the valuable discoveries which are being made in the various branches of science. One of the duties of the director of scientific research is to ensure that all development work proceeds in full knowledge of the latest scientific discoveries, for, however academic a piece of research may seem, it is certain that, sooner or later, practical and useful application will be found for it. The director of scientific research is in constant touch with scientific work and workers of all kinds, whose researches have a bearing on subjects which are of naval interest, and it is in order that special problems of naval importance, but which are otherwise of limited usefulness, may receive immediate attention, that the research laboratory is being constructed. Concerning the nature of the work which is to be carried out at Teddington, we are unfortunately unable to say much. It may, however, be stated that, although many of the investigations are secret, yet the results of others, such as those relating to acoustic signalling and leader gear, are even now being published, so that the benefits which research in those directions is bringing to the seaman may be more fully appreciated. It may not be generally known that an apparatus is already approaching the trial stage, which, when perfected, will give on a dial continuous indications of the depth of water beneath a ship, whether she is in motion or at rest. Those who know the labor, inaccuracy and delay which were inseparable from the old systems of wire sounding will understand what an enormous advance this achievement represents. One of the chief reasons among the many which led to the adoption of the Teddington site for the new laboratory was its central position with regard to important centers of research and scientific thought, its closeness to the National Physical Laboratory and to the headquarters of the director of scientific research at the Admiralty. During the war, a different policy was followed, and research stations were often hidden away in obscure and distant corners of the country, where their work might be carried on with the least fear of interference or observation. Though Teddington is not on the sea coast, there need, we are assured, be no fear that its work will drift away from the requirements of the navy, or that the thoughts of the workers will not be fully in tune with those of the sailor. Arrangements, we are glad to know, are being made whereby a constant exchange of information will be kept up between the existing naval experimental establishments at Portsmouth and elsewhere, and the director of scientific research and his staff, while naval officers are to be given opportunities for visiting the laboratory and seeing how the way is there being prepared for them in advance. Furthermore, it is the admirable intention to allow civilian scientists, who have perfected devices as far as possible in the laboratories, to visit naval ports and go to sea in order to supervise the initial trials of the devices which are the result of their efforts.

Intelligent observation of the papers and of the variety of the opinions which have been evoked by the publication of the Jutland reports, can only lead to one feeling, and that is one of uncertainty as to what the future holds for naval power. Capital ship or submarine? Gun or torpedo? No one can tell; but all who think will agree that we cannot longer rest secure

in our islands, relying only on the natural qualities of our seamen and our ships to protect us. It is our clear duty to help them by all those means that scientific knowledge alone can offer, and to give such facilities for research that we may be found ready and prepared for any of the great changes which to-day or to-morrow may bring forth.—*The Engineer*, Dec. 31, 1920.

THE NAVAL ENQUIRY.—*By a Sea Officer*.—A correspondent of the *Daily Chronicle*, which is usually regarded as a government organ, suggested last week, in an article on the work of the sub-committee which is investigating the proposed naval program, that if the report were adverse to the Admiralty proposals it would compromise the position of Lord Beatty as First Sea Lord and might result in his departure from office. Several highly important questions are raised by this suggestion, and it is as well to consider for a moment how the position stands.

In the first place, the sub-committee is not sitting in judgment upon purely naval proposals. According to the announcement of Mr. Chamberlain when it was appointed, the sub-committee is undertaking an investigation into the whole question of naval strength as affected by the latest developments of warfare. It has to decide, in effect, whether it is still necessary or expedient for this country to maintain its supremacy on the seas, or a position of equality with the next strongest sea power, or to be content with supremacy in Europe. Manifestly other factors than naval arise in the consideration of such a problem, and, this being so, it is difficult to see how a decision can affect the position of the government's naval advisers. The responsibility is with the cabinet, and if their decision is based chiefly, or even only partly, on considerations other than naval, it can scarcely be influenced by anything or anybody within the naval sphere. It would be totally different if only naval policy were involved, because in that case rejection of Admiralty recommendations would be tantamount to a want of confidence in the Board.

It is a well-accepted principle in regard to such matters that it is the function of the statesman to define the end and of the specialist to devise the means. If, therefore, the sub-committee—three out of the four working members on which are Cabinet Ministers, for Mr. Churchill is taking no part and Mr. Long appears to be too unwell to attend—recommend, and the cabinet concur, that it is no longer necessary for the country to be prepared to defend its coasts and commerce and maritime communications against all comers, then the responsibility of the Admiralty ceases in that respect. The late Sir Geoffrey Hornby, whose dictum every naval officer holds in respect, once put the matter very plainly, when he said that if asked to defend the Channel he would state what he required in the way of ships and men, because that was his business. If the government said the cost was too much, or decided for other reasons not to proceed with the defence, that was their business, and he had no ground for complaint. But if the government said he asked for too many ships and men to defend the channel he would be justified in refusing to proceed, for the strength of his force for a given task was solely his business, and the government knew nothing about it. The same rule applies to-day.

Another phase of the matter altogether concerns the wisdom of putting before the Committee of Imperial Defence a question which, while largely financial and political, also concerns such a technical matter as ship design. Mr. Balfour, than whom there is no higher authority on the committee's genesis and functions, said in 1905 that it would be in the highest degree inexpedient if it attempted to deal with matters which were strictly departmental he added:

"If the committee were to be treated as a Court of Appeal . . . against the decisions come to in their own departments, either by the First Lord of the Admiralty or the Secretary of War, in the first place the committee would be hopelessly overburdened, and, in the second place, the efficiency

of the departments which it attempted thus to supervise would be destroyed, and the responsibility of the Ministers at the head of them would be absolutely shattered."

Curiously enough, in what now seems prophetic vein, Mr. Balfour said: "It is not for us to advise, much less to determine, what type of battleship, armored cruiser, or field gun should be adopted, or what military organization or naval distribution should be accepted by the government, by the House, and by the country." Mr. Balfour made the important qualification that where problems concerned neither army nor navy alone, but both jointly, a solution might be undertaken by the committee, as, for instance, in regard to the defence of ports by submarine mines. The army authorities favored these, the navy held the contrary view, and the committee agreed with the latter, but this decision did not lead to the resignation of the army board. The question now before the committee is admittedly interdepartmental, and affects all three arms, as well as having financial and political aspects of the utmost importance just now. There is no reason, therefore, why the Admiralty should feel aggrieved if the decision is not exactly that which they would in other circumstances have wished for. Lord Beatty and his colleagues will have done their duty in bringing the matter forward and having it thoroughly thrashed out.—*The Army and Navy Gazette*, Jan. 29, 1921.

NAVAL EXPERIMENTS.—In view of the very great and general interest being taken at the moment in naval matters, we think it well to refer again to a topic which is absorbing the minds of naval architects, engineers and others in most of the important countries of the world. Popular attention has been stimulated as much by the sharp differences of opinion that have been forcibly expressed as by the financial issues involved. The naval lessons of the Great War were of very considerable magnitude, but it must definitely be remembered that these lessons were very far from being so complete as to give rigid solutions to questions concerning the future results of combats between all the probable combinations of fighting forces at sea.

In order clearly to gain a perspective view into the future, not only should the lessons of recent naval actions be considered, but, due attention must be paid to the present position of the science and art of naval warfare, which is considerably in advance of that exemplified by the fighting machines involved in the Battle of Jutland. Subsequent construction has benefited by the experience there gained.

If, then, the present actual position be taken, the answer is probably correct that a battleship can be constructed which, when finished, will be able to withstand, with reasonable chances of successful issue, any attack that could be made upon it on the sea, from under the water or from the air, using the known and proved methods of offence and defence available to-day. But what are the future potentialities of the battleship, of submarines and of aircraft? The first is highly developed and the increase of offensive and defensive powers which it can hope to attain in the near future, even in the forecasts of the most expert minds, is somewhat limited, whereas, with under-water and aircraft the potentialities are undoubtedly much greater. Progress through evolution and invention must in the natural order of things be relatively rapid in these new fields of engineering endeavor, which are only as yet in their earliest infancy.

The problems, therefore, now before the Committee of Defence appointed by the government resolve themselves into firstly, a study of the international situation to ascertain whether machinery for naval defence in addition to, or in advance of, our present forces is called for, and if so, secondly to determine what steps should be taken towards such improvement or augmentation, and to formulate the extent of the additional provisions of defence deemed necessary. It may, of course, be assumed that some scheme will be formulated, but it is hoped that it will not be found

necessary to initiate such measures as would be burdensome to the country in its present financial position.

There are, then, defensive and offensive weapons to be considered. The whole history to date of naval warfare and the development of its machinery resolves itself primarily into a continuous struggle between the striking power of the shell and the resisting power of armor, with the balance sometimes in favor of the one and sometimes showing the other to advantage. To-day the contending forces are many times multiplied in number and are of a diverse character. The advances in the power of explosives have been rapid, and the limiting conditions have changed. It is submitted that while the records of the war are complete and are most informative, they require substantial confirmation and further expansion by a series of carefully-conducted experiments and trials on a scale sufficiently large to ensure definite results, whether positive or negative.

Many torpedoes in the war missed their mark, because of having insufficient speed to prevent the enemy from maneuvering out of the line of attack. To what extent can this speed be increased and the striking power of the torpedo intensified? What is the accuracy of fire with aerial torpedoes from the air? If it is of a high order, how can battleships or purely surface ships be adequately protected against damage to the vital organs through the easy access by way of funnels and uptakes? Must not the design of the means of emitting the waste gases from large surface fighting ships be entirely re-designed in view of the possibility of successful surprise attack from the air?

Aircraft as a defence against air attack form a known quantity. Can means be devised whereby a capital ship can use them, as a weapon, so that they can return to their floating base and land there without necessitating the stopping of the ship to pick them up from the water?

There is no type of war vessel so limited in power and size as the submarine. This statement is made quite apart from considerations of the necessity for certain types to operate in shallow water. High surface speed can be gained at the expense of submerged power, and conversely. In the case of the famous British *K* boats a surface speed equal to that of the battle fleet they were accompanying, was achieved, but when the battle ground is reached such craft require to submerge for safety, being much slower than destroyers and more vulnerable in consequence. The time for accomplishing the diving operation is to some extent proportional to the displacement and surface speed, and so constitutes a weakness in the case of these large and fast craft. The submerged speed is only a fraction of that of the fleet, and therefore such submarines would in practice probably be constrained to fall out of the main action. Moreover, the depth charge is a very powerful weapon against submarines. This difficulty of the low submerged speed of submarines having a high speed on the surface would, if surmounted, give to this type of craft a very much greater importance than it has to-day, and resolves itself again into the necessity for research in the great field of prime movers.

Unquestionably the Diesel engine possesses many great advantages in principle when considered for the propulsion of war craft. These have been, if anything, over emphasized in the past, yet, progress is steadily being made, and the latest news that successful trials on shore have been carried out abroad, with a six-cylinder submarine engine developing some 400 brake horsepower per cylinder on a total weight of 44 pounds per brake horsepower, marks an advance on the best results in the past. The large German engines, it will be remembered, only developed 300 brake horsepower per cylinder as a maximum on a considerably greater weight than that just quoted. The longed-for internal-combustion turbine may possibly appear on the horizon. News from Germany shows that this type of machine is being investigated there. The very nature of this problem, however, suggests that its solution will come in two stages, the first by way of the enunciation of some new principle of heat utilization and the second,

by the invention of means and the discovery of materials which will enable the principle to be put into successful operation. There may be much lapse of time between the accomplishment of these two suppositious stages, yet this issue cannot be overlooked. In any case these reports emphasize the necessity for considering seriously the many problems which arise, bearing in mind the rapidity with which we are moving in these new fields of engineering development.

Considering even the type of marine machinery best suited at present for high power production on a limited weight there are still many links in the chain, from fuel combustion to power output at the propeller, upon which little improvement has been made for some years. Are these incapable of advancement if subjected to the searching and analytical light of modern scientific methods?

The navy in the past has relied chiefly upon private enterprise to carry out the necessary experiments in prime movers, and this system has worked well. It must, however, be supplemented to-day by Admiralty-conducted experiments. The reasons calling for a change in procedure are the altered conditions which operate at the present time, as has been pointed out by Sir George G. Goodwin in the chapter contributed by him to the last issue of *Brassey's Naval Shipping Annual*.

It must be recorded that a certain amount of work has been done in this direction in the past, and is still being pursued, notably at the Admiralty Engineering Laboratory. Much more, in our opinion, is, however, required. Firstly, to give a more definite aim to such work, in the light of all the advances in science made to date, and, secondly, to enable the lines of work indicated to be more swiftly and rigorously pursued.

Many such advances as would no doubt be made, in the direction of the expansion of knowledge of scientific facts, or in the happy event of invention and discovery crowning such research, would have a bearing, remote may be in some cases, on the trend of commercial operations. This has been so often the case in the past, as, for instance, with watertube boilers, mechanical gearing, thrust blocks, etc., that it is quite unlikely that naval engineering will now branch off into an entirely different channel from the paths which mercantile marine engineering must follow. Thus the added advantage of commercial gain may legitimately be put forward as an additional and strong plea for a generous consideration of the proposed line of action of naval experiment and research.—*Engineering*, Jan. 21, 1921.

AMERICAN SHIPPING.—If sea interests are accepted as furnishing the chief reason for naval power there would be no difficulty in proving Britain's need of an overwhelming navy. According to the latest issue of *Lloyd's Register*, the mercantile tonnage under construction in the United Kingdom at the end of last year was 3,708,916 tons, or rather more than half the total figure for the whole world. We have caught up with and passed the United States, and it does not look as though that country will regain the temporary lead which her great shipbuilding spurt won for her during the war. There has been, in fact, a very substantial decrease in the output of American tonnage since the close of 1918, the reduction amounting to nearly 70 per cent, while at the same time a large part of the American merchant fleet has been laid up. Only last week the United States Shipping Board announced its intention to withdraw from service and lay up an additional thirty ships, representing 180,000 tons gross. What with high wages, colossal running expenses, and falling freights, shipowners across the Atlantic find it increasingly difficult to carry on, and the bright dreams of an American sea-carrying monopoly have long since faded away. If the process of shrinkage continues at the present rate the United States may find itself some years hence in the anomalous position of owning the world's largest navy side by side with a mercantile marine of insignificant dimensions. The British nation may justly feel gratified at having reestablished its former shipping supremacy, but it is to be feared

that the decline in American tonnage power will coincide with a German revival in the same direction, a change by no means to our advantage. Not much has been heard of late about the German-American shipping alliance concluded at the instance of Admiral Benson on the one hand and the directors of the Hamburg-Amerika Line on the other. This compact does not seem to be altogether popular in the United States, many shipowners declaring that the Shipping Board has gratuitously subsidized America's most formidable rival.—*The Army and Navy Record*, Jan. 26, 1921.

SHIPPING STATISTICS.—The various shipbuilding companies have issued their shipbuilding statistics for the year, and they form interesting reading. Although many factors have militated against a big output, yet the average has been well maintained, and on the Tyne a substantial increase is shown over the figures of last year. The total output on the Tyne is 349,266 tons, compared with 274,649 in 1919, and 357,360 in 1914. Messrs. Swan, Hunter and Wigham Richardson head the list with 79,630 tons, compared with 62,020 in 1919, and are followed by the Northumberland Shipbuilding Company, who have advanced from 44,480 tons in 1919 to 61,691 tons. Messrs. Hawthorn and Leslie show an increase of from 14,857 tons to 34,002 tons; but Armstrong, Whitworth and Co. have a less output, their figures for 1919 being 43,250 tons, compared with 41,229 tons this year. The Wear continues to be a serious rival to the Tyne, and the output—333,335 gross tons, representing 67 vessels—is only short of the Tyne figures of about 16,000 tons. Had it not been for the tug boatmen's strike, of course, and the accident at Messrs. Swan, Hunter and Wigham Richardson's yard which prevented the launching of the *Laconia*, the output on the Tyne would have been greatly increased, and would easily have exceeded that for 1914.

It is proposed to form a Joint Committee of Employers and Employed on Tyneside in connection with the National Alliance of Employers and Employed, for the purpose of assisting to promote a reasonable and good understanding between employers and workmen on all industrial matters. Several of the local trade union delegates are taking an active interest in the proposal which is all to the good.—*The London Journal of Commerce Weekly*, Dec. 23, 1920.

JAPAN

PREMIER HARA'S DEFENCE OF JAPAN.—As a government official it is very difficult for Premier Hara to publish his views, he tells us, so that he expressly stipulates in the Tokyo *Chuwo* that he signs his article defending Japan against the charge of militarism solely in his capacity as "one of the Japanese subjects." That an official of the Japanese Government should publish a signed statement, we learn from the Far Eastern press, is almost without precedent; and that the premier should do so is not considered as establishing a precedent, but rather as an indication of the effect on the Japanese mind produced by so much clamor against Japan's alleged militarism. This, among the many misunderstandings entertained by foreigners about Japan, says Premier Hara, is "due to lack of study." Many criticisms of the Japanese are much to the point, he admits, and "may be taken as useful advice to improve ourselves." But, in the main, criticisms of Japanese national characteristics are not properly founded, and, Mr. Hara proceeds:

"Japan has no record in her history of having conquered other races, as everyone knows. The foreign wars in the Meiji era, especially the Russian War, were simply wars for self-defense against foreign aggression. In how difficult a defensive position Japan was placed in the Russian War the intelligent men of England, who financially and diplomatically supported Japan, and the intelligent men of America, who officiated in bringing about peace, should know full well. As the result of the war with Russia, Japan came to control Korea, Saghalien, and Manchuria, which was recognized

by the powers as necessary to remove the root of evil and ensure peace in the Orient. The powers then heartily supported Japan's move."

Because Japan's history is rich in records of warfare, Mr. Hara goes on to say, it is a great mistake to conclude that the Japanese people are an "entirely warlike race." The wars of Japanese history have been "political wars," and in the days before civilization had progressed, "political and military wars were employed for the same purpose by all countries which are now civilized." He then points out that—

"In Japan these wars were fought when men in power lost the confidence of the people and new men of power rose with popular confidence back of them to replace the old. While different in form, in the essentials the government by public opinion as it is now called had been in practise in Japan from olden times. For instance, when the Soga family lost its power, it was replaced by the Fujiwara family, and the Fujiwara were replaced later by the Tairas and the Tairas in turn by the Genjis. One family or faction could not monopolize power very long. According to the degree of wisdom and power of the people in each period, the government of democracy was really conducted."

The second misunderstanding about Japan, according to Premier Hara, is that she is "selfish" and promotes her own interests regardless of the interests of other nations. So her critics cry that Japan's development is "a menace to the world and that her development is undesirable." This charge also is "astonishingly wrong," declares Mr. Hara, who confesses that he cannot discuss in detail each and every accusation against the Japanese, but will meet some of them:

"I confidently believe that the charges described in the foregoing paragraph represent biased views of a very small minority. The majority of intelligent persons in Europe and America do not entertain such views. We need not refer to ancient illustrations. Regarding the attitude of Japan in the European War, we want a fair judgment rendered by foreign critics. . . .

"Had Japan, for her self-interests, disregarded the mutual safety of the Allies and indulged in cunning tricks, unexpected results might have been created. That is a self-evident truth. Yet Japan has never resorted to such tricks. She went resolutely and unflinchingly to the cause of victory for the Allies, thus engaging in the preservation of the world.

"Japan has never violated international laws or international faith. She has been rather too timid to do so, or too inexperienced for it. In other words, she has not yet been degraded to that extent. If there is any fault to be found with the Japanese, it may be, as critics at home tell us, that Japan is too modest and reserved. In respecting international obligations and in being loyal to friendly nations, there perhaps is no country which will surpass Japan, though many nations apply the same principles of moral conduct between nations as between individuals.

"To be sure, we cannot say that there has been no cause for misunderstandings as regards affairs with China in the past, but that was a question of the ability of the men in power at the time. It was not due to any of the traditional principles of Japan. That the result of the deals with China were not such as a section of Americans have understood them to be, is a matter which has now been brought home clearly to the people of the world. Of that I am firmly convinced."

In sharp contrast to the foregoing is the statement of a contributor to the London *Quarterly Review*, that, owing to the success of the militarist party in Japan during the past twenty-five years, "the mass of the nation is intoxicated by the glamour of arms," and is proud to style the land *gunkoku*, or "war country." The wiser heads in Japan are not deceived by this "dizzy progress," and the London *Quarterly's* contributor quotes Dr. Yoshino Sakuzo, a leader of the Tokyo intellectuals, as saying in January, 1920, the following: "I am glad that there are an increasing number of men who think that all these Chinese and Korean troubles are

the results of a mistaken policy pursued in the past, and that nothing short of a fundamental reversal of that policy will be of any avail in solving the difficulty." The "old pacifist opposition has by no means faded away," and the defeat of Germany has "strengthened the hands of the moderates," says the London *Quarterly's* contributor, who proceeds:

"However that may be, Japan, at the beginning of the greatest war in history, was one of the most martial-spirited nations in the whole world and was governed by a militarist oligarchy. Yet the part she played in the war was smaller than that of any of the belligerents, except the South-American Republics and China; and the interest taken by Japanese in the great events of Europe was so detached that it became a commonplace to brand them as pro-German. But apart from her obligation to the Alliance, there was one reason why Japan could not possibly stand aside altogether from the conflict. That reason was China. China is almost always the reason for any move in Japan's foreign policy. Japan, like a bustling, energetic planet, swings in a constant orbit round that inert, incongruous luminary which is China with its riches, its treasures, its huge population, and its immense possibilities. A strong policy for Japan means a strong policy in China. Militarism in Japan means aggression against China. The large and well-equipped Japanese Army is maintained to overawe China; and the admirable and growing navy exists to keep communications with the continent intact. China supplies iron in a quantity essential for Japan's existence, and an increasing provision of cotton and wool; and she is the principal market for Japanese manufactures."

Without any doubt, the more enterprising statesmen of Japan believe that the future of their country is "a future of domination in China," and this informant says this means—

"That Japan will one day control China's armies, arsenals, railways, mineral resources, police, finance, and customs administration; that she is called upon to play in this huge country the rôle which England has played in India; and that in the liberation of Asia from the white oppression in China will be her 'splendid second.' The European War meant to Japan her first opportunity to play a lone hand in China. To Japan, this was not the war of the German supremacy, but a third chapter in the war for Japanese supremacy in Asia. The Chinese War of 1894 was the first chapter; the Russian War of 1904 was the second; and the war of 1914 was to Japan merely a sequel to the struggle for Port Arthur. China, not Europe, was her battlefield. Yuan Shi Kai, the President of the Chinese Republic, was her enemy, not William II. The fortunes of war in Flanders and in Poland were a secondary matter to her politicians. Peking, not Berlin, was her objective; and it is the Chinese people who have had to pay for Japan's victory over Germany.—*The Literary Digest*, Jan. 22, 1921.

THE UNITED STATES AIRCRAFT CARRIER "LANGLEY."—The *Jupiter*, which is familiar to the public as one of our naval colliers, is now at the navy yard, Norfolk, undergoing alterations to refit her as a government carrier. She has been renamed the *Langley* in honor of Professor Samuel Pierpont Langley, whose extended pioneer experiments on the problem of mechanical flight made his name widely known.

All of the coal-handling gear has been removed and in its place there is being built a flying deck, located about 56 feet above the waterline and extending from bow to stern, a length of about 525 feet. This deck has a width, amid ships, of about 65 feet, and it will be flush all over, so as to make an ideal platform for flying off and landing. Means will be provided on this deck for rigging an arresting device to facilitate landing. Catapults for projecting the planes to give them the necessary speed for flight will also be provided forward and aft. An elevator will be installed for hoisting the planes from below to the flying deck and around this elevator a palisade will be provided to form a wind break for protection to the planes while being assembled.

UNITED STATES

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION.
AS REPORTED JANUARY 31, 1921

Type, number and name	Contractor	Per cent of completion			
		Feb. 1, 1921		Jan. 1, 1921	
		Total	On ship	Total	On ship
<i>Battleships</i>					
44 California	Mare Island Navy Yard.....	95.5	94.7	95.2	94.2
45 Colorado.....	New York S. B. Cpn.....	66.7	62.6	64.8	60.2
46 Maryland.....	Newport News S. B. & D. D. Co.	93.	92.2	90.	89.1
47 Washington	New York S. B. Cpn.....	57.6	49.8	55.4	47.3
48 West Virginia.....	Newport News S. B. & D. D. Co.	44.5	33.2	41.2	29.2
49 South Dakota.....	New York Navy Yard.....	22.3	13.5	19.8	12.
50 Indiana.....	New York Navy Yard.....	18.2	9.4	14.8	7.1
51 Montana.....	Mare Island Navy Yard.....	16.6	9.5	15.9	8.3
52 North Carolina.....	Norfolk Navy Yard.....	21.8	13.4	19.8	12.1
53 Iowa.....	Newport News S. B. & D. D. Co.	13.1	9.2	11.9	8.6
54 Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	1.2	....	.7	....
<i>Battle Cruisers</i>					
1 Lexington	Beth. S. B. Cpn. (Fore River)..	7.7	1.1	5.1	.5
2 Constellation	Newport News S. B. & D. D. Co.	5.1	2.7	3.6	2.1
3 Saratoga	New York S. B. Cpn.....	13.3	6.6	11.3	5.6
4 Ranger.....	Newport News S. B. & D. D. Co.	1.	.4	9.	.3
5 Constitution.....	Philadelphia Navy Yard.....	2.3	.8	1.8	.6
6 United States	Philadelphia Navy Yard.....	2.3	.8	1.8	.6
<i>Scout Cruisers</i>					
4 Omaha.....	Todd D. D. & Const. Cpn.....	88.4	80.1	84.4	77.5
5 Milwaukee.....	Todd D. D. & Const. Cpn.....	79.	72.7	74.4	70.9
6 Cincinnati.....	Todd D. D. & Const. Cpn.....	64.2	54.2	54.4	44.
7 Raleigh	Beth. S. B. Cpn. (Fore River)..	42.2	26.3	35.6	20.7
8 Detroit.....	Beth. S. B. Cpn. (Fore River)..	41.9	26.	34.7	19.8
9 Richmond	Wm. Cramp & Sons Co.....	59.	....	58.	....
10 Concord	Wm. Cramp & Sons Co.....	58.	....	57.	....
11 Trenton	Wm. Cramp & Sons Co.....	39.	....	38.	....
12 Marblehead.....	Wm. Cramp & Sons Co.....	37.	....	36.	....
13 Memphis.....	Wm. Cramp & Sons Co.....	30.	....	28.	....
<i>Miscellaneous</i>					
Fuel Ship No. 18, Pecos.....	Boston Navy Yard.....	59.	57.	51.5	49.
Gun Boat No. 22, Tulsa.....	Charleston Navy Yard.....	49.9	35.9	43.8	32.1
Ammunition Ship No. 2, Nitro.	Puget Sound Navy Yard.....	99.8	99.2	99.7	98.8
Repair Ship No. 1, Medusa...	Puget Sound Navy Yard.....	51.6	36.6	49.3	35.8
Dest. Tender No. 3, Dobbin...	Philadelphia Navy Yard.....	49.3	49.	45.4	45.
Dest. Tender No. 4, Whitney...	Boston Navy Yard.....	15.	4.4	7.5	3.
Sub. Tender No. 3, Holland...	Puget Sound Navy Yard.....	7.8	....	7.1	....
Aircraft Tender, Wright.....	Tietjen & Lang.....	38.	....	25.	....

In addition to the above there are under construction 28 destroyers and 44 submarines.

There were delivered to the Navy Department during January, 1921, 3 destroyers and 1 submarine.

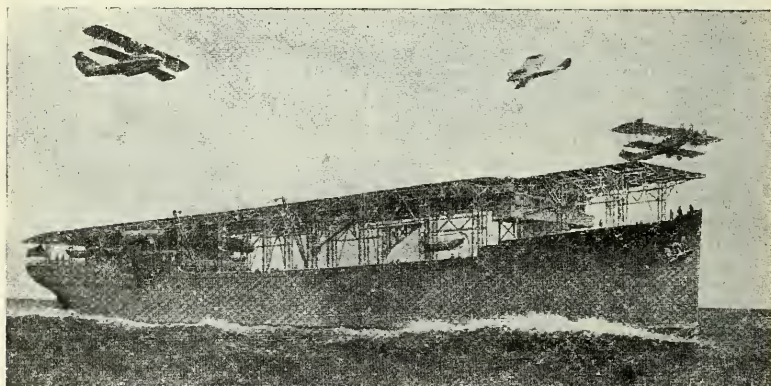
Authorized but not under construction or contract 12 destroyers, 7 submarines and 1 transport.

Two cranes with large outreach, one on each side of the vessel, will be provided to hoist aircraft out of the water and land them on the hangar deck, which is the deck next below the flying deck. Beneath the flying deck, traveling cranes will be provided for hoisting planes from the hold and for transferring them fore and aft to the shop spaces and elevator. Shop facilities for repairing the planes will include a machine shop, a wing repairing shop, molding spaces, a metal shop and various store rooms.

The hold spaces are being refitted for the stowage of aircraft and their accessories, including aircraft ammunition in the way of bombs and torpedoes, ship's ammunition, fuel oil and gasoline. An elaborate system will be provided for distributing gasoline and lubricating oils to various stations on the hangar deck and flying deck. The characteristics of the *Langley*, refitted as an aircraft carrier, are as follows:

Length between perpendiculars.....	520 feet
Length over-all	542 feet
Beam	65 feet
Speed about	15 knots
Displacement about	12,700 tons
Gasoline capacity	578 tons
Guns	4-5 inch

The smoke pipe has been rearranged so as not to obstruct the flying deck and to keep the smoke clear of this deck, in order not to interfere with



THE "LANGLEY" (FORMERLY COLLIER "JUPITER"); FIRST AIRCRAFT CARRIER FOR THE UNITED STATES NAVY.

Length: over-all 542 ft.; *Displacement:* 12,700 tons; *Speed:* 15 knots; *Armament:* four 5-inch guns; *Aircraft Complement:* 12 single-seater pursuits; 12 two-seater fire control; four torpedo planes; six seaplane torpedo planes.

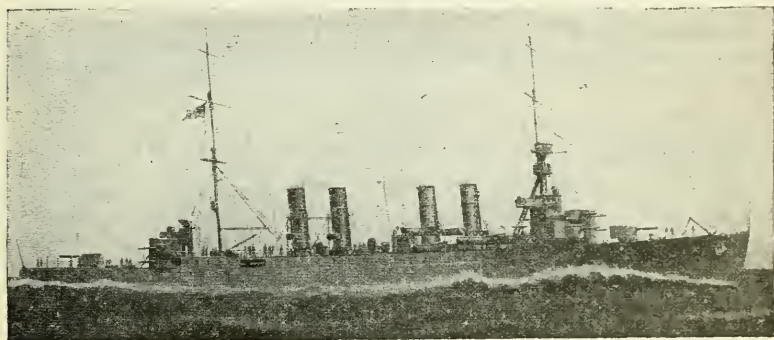
making a landing. This will be accomplished by providing a short smoke pipe on each side, clear of the flying deck, which will be interconnected so that the smoke can always be discharged on the lee side. One of the smoke pipes will be arranged to hinge downward when considered necessary to discharge the smoke near the water; the other is arranged to discharge the smoke downward through a water spray.

A radio outfit will be provided, carried on masts which are capable of being completely housed below the flying deck. The *Langley* will carry an

auxiliary radio outfit, so that the planes can be communicated with when the main radio outfit is housed.

The *Jupiter* as thus reconstructed under her new name of *Langley* will carry 12 single-seater pursuit planes capable of maintaining a speed of 100 knots for three hours; 12 two-seater fire control planes capable of cruising for four hours at an elevation of 10,000 feet and having a full speed of 100 knots; four torpedo planes capable of flying at 100 knots for two hours, and six seaplanes built as torpedo planes capable of 80 knots' speed for four hours.

THE UNITED STATES LIGHT CRUISER "OMAHA."—An important section of the three-year program which was drawn up before we entered the war was the provision for 10 scout cruisers, a comparatively new type of vessel, at least as regards its steaming radius and high speed. The most notable features of our new designs as compared with those of contemporary navies was their high speed of 35 knots, their large displacement of 7100 tons, and their battery of eight 6-inch guns.



NEW SCOUT CRUISER "OMAHA"—CLASS OF TEN SHIPS.

Length: 555½ ft.; *Beam:* 55 ft.; *Draft:* 13½ ft.; *Speed:* 33¾ knots; *Armament:* twelve 53-caliber 6-inch guns; two twin, 21-inch torpedo tubes.

Since the designs were first drawn up, modifications have been made in the direction of increasing the strength of the hull and the power of the battery, and this has resulted in an increase of the displacement from 7100 to 7500 tons and a decrease in the speed to about 33.75 knots.

As will be seen from the dimensions, these vessels, so far as the hull is concerned, are practically exaggerated destroyers; for with a beam of 55 feet and a mean draft of 13 feet 6 inches, they are 556 feet 6 inches in length over-all, giving a ratio of beam to length of one to ten. When the designs were first brought out, some fear as expressed as to whether their shallow depth, as affecting their girder strength, would not cause them to strain heavily when steaming head to sea; but from the official drawing from which our own wash drawing has been prepared, we gather that the freeboard for over one-third of the length amidships has been raised one deck. If so, this will give greater strength and add both to their seagoing qualities and to their appearance. There is a pronounced sheer with considerable lift toward the bow, which, even as it is, will be none too lofty if these boats are to be driven at nearly 34 knots in average

weather. The motive power as originally designed consisted of geared turbines operating on four shafts with a combined shaft horsepower of 90,000.

The battery will be numerous and powerful, consisting of 12 of the new-pattern 53-caliber 6-inch guns. It will be mounted as follows: On the forecastle deck will be a two-gun turret, abaft of these on each side of the bridge will be two guns mounted in superposed sponsons, all of these six guns being forward of the bridge. Aft will be a similar arrangement of six guns, namely, a two-gun turret well aft on the quarter-deck, and forward of this, on each side, two guns in superposed turrets, these latter being slightly aft of the after bridge.

An interesting novelty, at least in the United States Navy, is the adoption of the British tripod mast, at the head of which is located a closed director-fire position, from which the fire of the battery of twelve 6-inch guns will be controlled. A secondary battery will consist of two 3-inch, 50-caliber aircraft guns and two 3-pounder saluting guns. The vessels will also carry two 21-inch twin torpedo tubes which will be located on either beam on the main deck between the aftermast funnel and the main mast. The boats will be liberally supplied with searchlights and range finders.

Altogether these vessels should prove to be very serviceable craft. The pity of it is that they are not in commission to-day. The only representatives of the light cruiser or scout class which we possess at present are those relatively slow and out-of-date scouts the *Birmingham*, *Chester* and *Salem*, the keels of which were laid 15 years ago.—*The Scientific American*, Jan. 15, 1921.

MERCHANT MARINE

WORLD'S SHIPBUILDING OUTPUT CONTRACTS IN APPRECIABLE DEGREE.—Shipping interests on this side of the Atlantic await with a great deal of interest the detailed statistics dealing with ships under construction throughout the world compiled quarterly by the Surveyors of Lloyd's Register of Shipping, a brief synopsis of which was cabled to the New York office of the society this week.

While there has been a general contraction in new ship construction orders not only in the United States and Great Britain, but throughout the entire world during the past few months, the aggregate tonnage on the ways at the beginning of the year was only about 5 per cent less than at the beginning of October, 1920, according to Lloyd's report.

It considers that, although the decrease is small it may prove to be the beginning of a decline as rapid as the increase which occurred since 1918, and emphasizes the fact that the tonnage completed is only 13 per cent of the total under construction at the beginning of the quarter, as compared with 23 per cent in pre-war times. The following condensed statistics were received by cable at the offices of the society, No. 17 Battery Place, where the full report is expected by mail soon:

SHIPPING CONSTRUCTION COMPARED

	Dec. 31, 1919	Dec. 31, 1920
United States	2,966,000	1,310,000
United Kingdom	2,994,000	3,709,000
Other Countries	1,901,000	2,160,000
World's Total	7,851,000	7,179,000

In so far as the figures grouped under the general designation of "other countries" are concerned, it is stated at Lloyd's that these are only approximate as accurate returns from Germany are not available at this time. It is remarked, however, that in small maritime nations, there is at present under construction a quarter of a million tons more of shipping than a year ago. France and Holland both show substantial gains in the amount of shipping now under way.

British Construction Declines.—For the first time since the war period, British shipbuilding shows a decline. The recession is only a small one, however, there being 3,709,000 gross tons in hand at the end of 1920, compared with 3,731,000 tons at the end of September, 1920. This decrease of barely 22,000 tons is overshadowed by the well-nigh staggering decrease of nearly half a million tons which the statistics for American shipyards show.

Construction in France increased from 293,000 tons to 397,000 tons while the gain noted in Holland for the quarter has been from 424,000 tons to 450,000 tons. These gains, however, have been offset somewhat by decline elsewhere. Italy has suffered least from the depression, the falling off amounting to barely 2000 tons.

As a result of changed conditions, more than one-half or 51.6 per cent of the world's shipbuilding is now under way in the United Kingdom as compared with a little more than one third, or 38.1 per cent, at the beginning of 1920. In the same period, the United States' share in the total has decreased from 37.7 per cent to 18.2 per cent.

During the period of intensified shipbuilding campaign in this country during the latter stages of the war and immediately following the armistice, the United States held the enviable position of having under construction more shipping than the rest of the world combined. It was only during the last three months of 1920 that Great Britain passed the 50 per cent mark, with an increase of 2.3 per cent of the world's total, while the share of the United States decreased 5.2 per cent.

Period of Depression Forecast.—Expansion of shipbuilding facilities in the United Kingdom, France and Holland have gone on apace up to this, while the same condition is said to apply to Germany. Conditions in Great Britain at this time indicate a marked change for the ensuing year, as deliveries are now at the point of exceeding new orders and a period of depression in the industry is forecast by leading authorities.

This general slowing up in the work is shown by the fact that in the quarter ending December 31, 1919, new steamers on which work was begun in the United Kingdom represented a total of 601,000 tons while launchings for that quarter represented only 451,000 tons. In the third quarter of 1920, new work aggregated 591,000 tons, while launchings were 478,000 tons and for the last quarter of the past year, new work begun totalled only 503,000 tons, while launchings represented 576,000 tons. Of Great Britain's total tonnage now under construction, fully one-third is for purchasers abroad.

Internal combustion engines are bound to play an increasingly important part in modern shipping as is indicated by reports to Lloyd's Register of Shipping which show that 454,000 tons of motorships are being built in the world at present. The greater part of this construction is in the United Kingdom, Holland and in the Scandinavian countries, while reports from Germany are to the effect that this class of craft is growing in favor.

Tank steamers under construction at the beginning of the year aggregated 169 of 1,169,003 tons, of which 88 of 637,100 tons were building in the United States; 64 of 422,533 tons in the United Kingdom, and 17 of 109,370 tons in other countries. This compares very favorably with a total of 795,000 tons of this class building at the end of September, 1920, of which 545,000 tons were under construction in the United States; 232,000 tons in the United Kingdom and 18,000 tons in other countries.—*The Nautical Gazette*, Jan. 15, 1921.

WORLD'S TONNAGE BUILDING ON FIRST OF YEAR.—According to Lloyd's shipbuilding returns, the tonnage under construction in the different coun-

tries of the world, with the exception of Germany, at the close of 1920 and 1919 was as follows:

	Gross Tons	
	1919	1920
British Dominions	186,655	251,480
Belgium	28,048	26,293
Brazil	3,768	.....
China	53,624	35,700
Denmark	121,279	100,335
Esthonia	1,100	.....
Finland	5,150	.....
France	397,969	216,775
Greece	1,500	1,500
Holland	450,964	328,338
Italy	363,784	314,547
Japan	248,513	309,474
Norway	83,928	92,719
Portugal	2,350	5,210
Spain	89,340	107,463
Sweden	122,578	107,765
United Kingdom	3,708,918	2,994,249
United States	1,310,312	2,966,515
	<hr/> 7,179,780	<hr/> 7,861,363

—*The Nautical Gazette*, Jan. 29, 1921.

WORLD'S SHIP OUTPUT IN 1920.—The United States led the world in the total of gross tons of merchant vessels launched in 1920, according to figures compiled by Lloyd's Register of Shipping.

The total launchings in shipyards of the world amounted to 5,861,000 gross tons, a decrease of almost 1,300,000 from the 1919 figure, but an increase of more than 400,000 over 1918.

Lloyd's points out that at the beginning of 1920 the United States and Great Britain had on hand virtually the same amount of construction to be completed, and credits American yards with greater speed than those in Great Britain, in that this country exceeded England's total by 20 per cent. The decline in the total world tonnage launched was attributed to the decline in the American shipbuilding program. America's launchings being 1,600,000 tons less than in the previous year. British production showed a gain of more than 400,000 tons. Other countries launched a total of about 1,330,000 tons during 1920, or about 20,000 tons less than in 1919.

The yearly output of the United States and the United Kingdom in launchings since before the war is shown in the following table, the figures being in gross tons:

	United States	United Kingdom
1913	276,000	1,932,000
1914	200,000	1,683,000
1915	177,000	650,000
1916	504,000	608,000
1917	997,000	1,162,000
1918	3,033,000	1,348,000
1919	4,075,000	1,620,000
1920	2,476,000	2,055,000

In comparison with pre-war figures, launchings in the United States were nine times as great as in 1918, and throughout the world there was a gain of about 75 per cent. For the first time since the beginning of the

war Great Britain last year exceeded its 1918 figures, the gain being about 7 per cent.

Considerable gains over 1919 were shown by France, which increased the total of its launchings to 98,000 tons last year; Holland, to 188,000 tons, and Italy to 133,000 tons. Figures for Germany were not available.

Lloyd's figures show that the United States far outstripped the rest of the world in construction of tanker tonnage. This country launched 567,000 gross tons of this class of vessels; Great Britain, 65,400 tons, and other countries, 8000 tons.

Of the vessels launched last year 32 were of 10,000 gross tons or more.

During 1920 there were launched in the world 190,000 gross tons of vessels fitted with internal combustion engines.—*The Nautical Gazette*, Jan. 29, 1921.

1920 GREATEST YEAR IN HISTORY OF NEW YORK HARBOR.—During 1920 no fewer than 10,986 ships of 35,829,149 net tons entered from or cleared for foreign destinations, according to port statistics of New York, which recently have been compiled.

This number of vessels exceeded by more than 1000 the record attained in any pre-war year and outdid by 23 per cent the showing of 1919. The greatest net tonnage recorded for New York during the years prior to the World War was approximately 14,000,000 tons.

Following is the record of the monthly entrances and clearances for the past year in the foreign trade:

Month	Entrances		Clearances	
	No. ships	Net tonnage	No. ships	Net tonnage
January	372	1,143,126	410	1,450,778
February	377	1,174,913	330	1,054,269
March	440	1,322,013	410	1,369,829
April	431	1,302,177	386	1,243,000
May	444	1,343,052	390	1,258,996
June	508	1,545,144	436	1,364,297
July	510	1,627,721	462	1,518,406
August	537	1,634,719	499	1,649,416
September	506	1,728,266	493	1,574,228
October	526	1,763,904	514	1,719,103
November	495	1,717,795	482	1,673,685
December	516	1,732,485	518	1,802,929
Total	5,662	18,068,306	5,324	17,760,843

The excess of entrances over clearances is due to the laying up of a large number of vessels at this port and to others being placed in repair yards for reconditioning.—*The Nautical Gazette*, Jan. 15, 1921.

LAST SHIP BUILT AT HOG ISLAND.—Shipbuilding at Hog Island, Philadelphia, once the world's greatest shipyard, ceased January 27, when the army transport *Aisne* was turned over to the Emergency Fleet Corporation. Early next month the American International Shipbuilding Corporation will turn the yard over to the United States Shipping Board. The *Aisne* is 448 feet long with a displacement of 13,400 tons. Her contract speed is 15 knots an hour.

Hog Island was created as a war emergency. At one time it employed more than 36,000 men and women. The first keel was laid at the yard February 12, 1918, and since then 122 vessels of a total of 856,750 dead-weight tons have been turned out.—*The Nautical Gazette*, Jan. 29, 1921.

INTERNATIONAL MERCHANTILE MARINE'S PECULIAR STATUS.—Aroused by the charge of Senator Wesley L. Jones that the International Mercantile

Company was precluded from properly furthering the interests of American shipping because of its being obligated by a contract made with the British Government in 1903 not to pursue a policy injurious to the British Merchant Marine or to British trade, the Shipping Board last week began a formal investigation into the status of that corporation. The hearing thus far held has revealed nothing new. Of the 1,015,000 tons of shipping owned by the company or its affiliated concerns, only 13 per cent is of American registry. More than five-sixths of the total tonnage controlled is under the British flag and cannot be removed from under the red ensign except with the consent of the British Government, which thus far has been refused except in one or two isolated instances. The title to these boats is in English subsidiary companies, the capital stock of which is almost entirely owned by the American incorporated Mercantile Marine Company. While the operations and disposition of the ships of these English affiliated companies is controlled by the British Government, British interests have no voice in the management of the parent Mercantile Marine Corporation, 94 per cent of whose stock is owned in the United States.

Although laying claim to the title of the premier American steamship concern, the International Mercantile Marine Company owns seven times as much foreign as American tonnage. Since its formation it has steadily developed its fleet of British ships and has acquired very little American tonnage. It is in the unfortunate position of being regarded with suspicion in British shipping circles on account of its New Jersey domicile and of being assailed in the United States as un-American because of its relations with foreign shipping interests. In order to end this anomalous situation, the Company in 1917 attempted to dispose of its holdings in British steamship enterprises for \$135,000,000 with the idea of investing the sum named in American vessels. But this plan was first held up by the Shipping Board and then rejected by the Mercantile Marine stockholders on the ground that the price offered was inadequate.

The question the Shipping Board will now have to decide is whether the ownership of a large amount of alien tonnage subject to the control of a foreign government disqualifies a shipping company from being considered thoroughly American and entitled to the allocation of government ships. This is a matter which should be looked into carefully. Any ruling to the contrary would be a new departure, for it has not been considered improper heretofore for American steamship companies to own vessels flying foreign flags. Within the last two years the United Fruit Company has had certain passenger and cargo boats built in British yards, which vessels have retained their British registry without objection on the part of anyone. This practice of American shipping interests owning foreign tonnage has not proven detrimental thus far to our Merchant Marine, but in view of the certainty of an intense rivalry for maritime supremacy between England and ourselves, companies with divided interests like the International Mercantile Marine may find themselves in not a happy position hereafter. In its present temper, the Shipping Board is not likely to give them the first call on whatever tonnage is to be allocated.—*The Nautical Gazette*, Feb. 5, 1921.

I. M. M.'s AGREEMENT PROBED.—At the inquiry held by the Shipping Board on Thursday of last week into the International Mercantile Marine Company's agreement with the British Government to pursue no policy injurious to the interests of the British Merchant Marine or to British trade, Mr. P. A. S. Franklin, president of the company, testified that the clause forbidding the company to pursue a policy prejudicial to British trade applied only to its British registered tonnage. While there was a clause in the agreement providing that a majority of the directors of the company's subsidiary corporations in England must be British subjects, the Mercantile Marine Company elected the directors through its ownership of stock.

Mr. Franklin also testified that 94 per cent of the Mercantile Marine Company's capital stock was owned in the United States and less than one-half of one per cent in England. He denied that any British interests had power over the policies of his company. Of the 1,015,000 tons of shipping owned by his corporation, 85 per cent was under the British flag and 2 per cent under the Belgian. At the close of the hearing the Shipping Board was asked to suggest methods whereby the Mercantile Marine Company could meet the requirements of the Board and expand its services under the American flag.—*The Nautical Gazette*, Feb. 5, 1921.

AERONAUTICS

THE MISSION OF AIRCRAFT WITH THE FLEET.—Let us examine the mission of aircraft with the fleet. The following duties are those which should be performed:

1. Bombing enemy's battleships and bases. Attack with torpedo-plane.
2. Protection of own fleet from hostile aircraft.
3. Scouting.
4. Reporting on movements of enemy over smoke screens, in low visibility and over the horizon.
5. Detecting mine fields, torpedoes, and submarines.
6. Spotting.
7. Escort.

1. *Bombing Enemy's Men-of-War and Bases.*—All offensive action must be carried on by heavier-than-air craft until a practical non-inflammable gas is in use for lighter-than-air craft. At present dirigibles are easy targets, as one incendiary bullet will set them in flames. They must keep away from hostile aircraft.

Offensive action against surface craft was not of much use in the war, but will become increasingly important. The reasons for the limited number of successful air attacks on vessels were: Lack of opportunity, small size of bombs, poor bomb sights, untrained bombers, insufficient number of planes and material, and a poor development of aerial strategy and tactics.

Some good work was done against submarines, and one R. A. F. Squadron (No. 217) sank at least two German destroyers, using DHs, and only 230-pound bombs. A Handley Page squadron (No. 214) that was operating from our aerodrome at St. Inglevert was dropping 1650-pound bombs. They were loaded with about 1100 pounds of T. N. T., as against only 29 pounds for 14-inch A. P. shell. If heavy bombs were made armor-piercing, they would sink any but capital ships and undoubtedly put dreadnoughts out of action.

If hostile aircraft are to be encountered, the large bombers, seaplanes and torpedo-planes *must* be, and the two-seaters *should* be, convoyed by fighters for day work.

All "day bombing" should be formation work, and should be concentrated.

With the present inaccuracy of anti-aircraft fire from ships, bombers could go over as low as 4000 feet in the daytime. At night, both bombing and torpedo work are much easier, as surface craft can generally be seen in any but the darkest nights, whereas aircraft are invisible and could go over as low as 2000 feet.

Bombs must be suited to their objectives just as projectiles are. Against capital ships and concrete, the largest possible bombs should be used. As already stated 1650-pound bombs were used in the war, and 3300-pounders were being experimented with when the armistice was signed. Against light cruisers, destroyers and bases not under concrete, a number of smaller bombs would be more effective; the 230 and 520 were mostly used. Against personnel, a large number of small bombs with good fragmentation, such as the 20-pound Cooper, are the best.

For action against surface craft and land objectives, heavy case bombs should be used, as the destructive effect of the fragments is important; whereas against submarines, light case with a correspondingly larger amount of explosive should be used, as the force of the explosion is the only consideration. For both submarine and surface craft bombing, a delayed action fuse is necessary; in the one case to get under water, and in the other (coupled with a heavy armor-piercing nose) to get through the upper decks.

With the accuracy of our new sights and the application of proper tactics and material, the importance of the future of bombing cannot be overestimated.

2. *Protection of Own Fleet from Hostile Aircraft.*—As the offensive use of aircraft outlined in 1 is increased, there must be a corresponding increase in defense. There is no doubt that the primary defense against hostile aircraft is fighting aircraft of your own. These give a much greater protection than is possible with anti-aircraft fire, which for many reasons is not nearly as efficient from ships as ashore. Fighting aircraft not only protect vessels from direct attacks, but if in sufficient numbers and properly handled, should prevent the enemy's planes from carrying out any of their duties, such as scouting, escort, spotting, etc.

There was no general aircraft fight at sea during the war, for the reason that the British did not realize the value of planes with the fleet until after Jutland, and never had another chance. The Germans did not develop seagoing aircraft sufficiently to attack, and the zeppelins were too vulnerable.

Efficient fighting aircraft are at present single- and two-seater, light fast planes, but undoubtedly in the future there will be a large flying boat which will be armored around the vital parts, and will carry cannon as well as machine-guns. French flying boats are already carrying 3-inch guns. This craft will have no "blind spots," and will be able to put out such a volume of fire that no small fighter can get in on her.

Lighter-than-aircraft should make formidable fighters, owing to their stability and the heavy armament they can carry, but only after a non-inflammable gas is adopted.

3. *Scouting.*—For scouting and long-distance reconnaissance aircraft are far ahead of surface craft because of their great speed. We now have seaplanes with a radius of 1200 miles. It is easy to see the efficient work a squadron of such planes could do with their speed of 60 miles per hour, coupled with efficient radio work. Dirigibles are also valuable in scouting, but at present are more liable to be weather-bound than seaplanes, as the latter can now go out in nearly any weather.

For scouting near the fleet, say up to 150 or 200 miles, the two-seater bombing and fighting planes could also be used, operating from the carriers.

Many valuable reports as to the movements of the enemy were made both from lighter- and from heavier-than-aircraft.

4. *Reporting on Movements of Enemy Over Smoke-Screens, in Low Visibility and Over the Horizon.*—Reporting enemy's movements overlaps scouting, but reports when in contact or almost in contact with the enemy can be made by nearly any type of aircraft including heavier-than-aircraft, dirigibles and balloons. The great value of aircraft for this work was proved in many maneuvers in the Grand Fleet. Many times when the fleet was absolutely blinded, due to smoke, poor visibility or distance, all the information desired by the admiral was sent down from the air. Types of ships, formations, base courses, changes in base courses, etc., are easily seen. Radio telephones should always be used for all communication work up to their distance limit, and then radio telegraph. Visual signals are only secondary in case of radio failure.

5. *Detecting the Mine-Fields, Torpedoes and Submarines.*—In detecting mine-fields and submarines from aircraft, two factors must be considered: The clearness of the water and the condition of the atmosphere. Ability

to see under water varies with these two factors. Under the most favorable conditions, such can be found in the Caribbean, very clear water and a strong sun overhead, it is possible to make out a shape over 100 feet under water. In muddy water, such as the Chesapeake in the spring, nothing can be seen a foot under the surface, and under-water visibility varies between these two conditions.

In general, in blue water, mines can be picked up some fathoms under, especially if there is a bright sun behind, and submarines to a greater depth. Of course, submarines light or awash are easily seen and the V-wake from a periscope is visible a long distance in moderately smooth water.

The wake of a torpedo is easily picked up, and if the aircraft is connected with the ship control by telephone, directions for avoiding it are of great assistance.

For detecting submarines, mines and torpedoes, dirigibles and balloons are probably more efficient than heavier-than-aircraft, owing to their ability to stay in one place, and their greater ease of observation. A great deal of this work was done in the war by all three types of aircraft. Minefields and floating mines were reported frequently, and many submarines discovered and attacked or reported to surface craft.

6. *Scouting*.—It is thought that two new factors when properly developed will mean a great deal to gunnery in the fleet. These are the use of star shells at night and aircraft spotting by day. The former was developed by the enemy on the Belgian coast. Star shells as large as 8 inches were used both against aircraft and men-of-war. The latter was brought to a high state of efficiency for land work on the Western front, practically all efficient long-range shooting being controlled by aircraft.

The Grand fleet was using aerial spotting for long-range work and an efficiency of at least 300 per cent higher was obtained from aerial spots than from ship spots. Our latest 14-inch 50-caliber gun can shoot over 28,000 yards, and undoubtedly will open fire at at least 25,000 yards in the future. It is not believed that ship spotting can be accurate at over 18,000 yards, whereas aircraft spotting is efficient for any distance and is not affected by smoke screens.

Kite balloons have the great advantage of direct telephone communication, but the disadvantage of giving away your position to the enemy. They also have a bad whip when a salvo is fired, and cannot be used in bad weather.

Dirigibles seem the best aircraft for this work, using radio telephone, but they also are liable to be weather-bound.

7. *Escorts*.—Escorting surface craft and submarines has been one of the most important duties performed by aircraft. There were almost no cases of submarines attacking a convoy when there were aircraft present, as the German commanders always submerged when a plane was seen or heard. The Dutch and channel convoys, and, towards the end, the French coastal convoys, were nearly always escorted by planes as well as surface craft.

Dirigibles are more suitable for convoying than planes, owing to the greater ease with which they can remain over the convoy. This obtains always, provided no contact is made with the enemy's aircraft, when dirigibles would probably be shot down.

The Navy of the Future and Aircraft.—In England, R. Blackburn, the aeroplane designer and one of the foremost authorities on the subjects of torpedo-planes, has written a very interesting letter to *Flight*, as follows:

"In the recent controversy on the trend of naval development, widely-divergent views have been expressed. Some eminent authorities have asserted that all large surface craft should be abandoned owing to their vulnerability by torpedo attack, while others maintain that large ships can be built, doubtless at considerable extra cost, to safely withstand torpedo attack. It would appear, however, that these in their turn would

be endangered by the advent of larger torpedoes carrying a heavier explosive charge.

"In no case has the value of the torpedo as a weapon been questioned, and it is interesting therefore to consider the advantages which are claimed for aircraft over the other means which may be employed for delivering a torpedo attack, namely, small high-speed surface craft (ranging from motorboats to destroyers) and submarines.

"In attacking with the torpedo, as in all forms of attack, the element of surprise is of the utmost value. For this reason the submarine has an advantage over surface craft, in that it can approach close to its objective with little chance of detection until within short torpedo range. It pays a heavy price, however, for this advantage in its lack of speed and maneuverability. Its lack of speed confines its operations largely to lying in wait for enemy ships, and if its presence is detected its poor maneuverability gives the enemy a good chance of avoiding the torpedo by rapid changes of course. Surprise can rarely enter into an attack by surface craft; an approaching destroyer would be visible to the enemy in fairly clear weather for at least ten minutes before getting within extreme torpedo range, and except in the case of opposing ships steaming towards one another, for a longer period.

"Torpedo-planes flying at upwards of 10,000 feet can begin to glide with engine off, and therefore silently, some ten miles away, remaining invisible until within three or four miles and probably undetected until much closer. Gliding at say 120 knots it is unlikely they would be seen more than minute before launching a torpedo at close range.

"Thus the torpedo-plane shares with the submarine the advantage of getting to close range unobserved, but on the score of speed and maneuverability is not merely not inferior to its target, but has about four times the speed of a fast ship, and can turn in a time measured in seconds as compared with minutes. Moreover, with a fraction of the personnel of one submarine, a whole squadron of torpedo-planes can be provided to converge from all points of the compass, and so render maneuvers such as change of course almost useless.

"The facility of getting to close range has not only the advantage of surprise, but also implies a much higher percentage of hits than can be hoped for with surface craft. When torpedoes are launched at a range of several miles, it is necessary in order to score a hit to estimate correctly the speed and course which the target will maintain or take up for some five minutes after the torpedo is discharged, and as change of course is commonly resorted to when a ship is attacked by torpedo, the percentage of hits to be expected is comparatively small.

"From the point of view of cost both as regards personnel and material, aircraft can claim a marked advantage. A flotilla of destroyers costing £300,000 or £400,000 each, and carrying 70 or 80 men each, would only in a heavy engagement average ten torpedoes discharged per ship. This would imply some seven or eight men and thirty or forty thousand pounds' worth of material employed and endangered for each torpedo fired. In the case of aircraft, there is only one man and a machine costing about five thousand pounds engaged for each torpedo fired. The implied assumption that each torpedo-plane risked has an opportunity of discharging its torpedo is justified because it is not visible, and therefore not endangered, until within striking distance; moreover, every ship sighted, or whose position is signalled by wireless, presents an opportunity to a machine having a speed some 70 or 80 knots superior to that of any ship.

"On the score of comparative results for the same cost, it is interesting to imagine what would have happened if in the Battle of Jutland our destroyers had been replaced by torpedo-carrying aircraft of the same monetary value, some part of the ships of the line being used as carriers. If there were a hundred destroyers employed, costing, say, thirty-five

million pounds, with crews aggregating 7000 men, torpedo-planes could have been provided to the number of 7000, which represents not less than 30 torpedo-planes to every ship in the German Fleet. The cost would have been the same, and the number of men endangered would have been the same, but whether any German ship would have returned to its harbor is another question."—*Flying*, February, 1921.

A NAVAL AIR SERVICE.—A thoroughly equipped, well-organized air service for the navy is imperatively demanded. The best authority in the United States on the subject makes the following estimate of the material for an adequate air force to cooperate with our battle fleet:

A

120	Torpedo and bombing planes, at \$40,000.....	\$ 4,800,000
70	Planes for long distance overseas scouting, at \$40,000.....	2,800,000
97	Fighting planes, at \$10,000.....	970,000
90	Spotting planes, at \$12,000.....	1,080,000
6	Rigid dirigibles for long overseas reconnaissance, at \$2,500,000	15,000,000
21	Non-rigids, at \$100,000.....	2,100,000
50	Kite balloons, at \$5,000.....	250,000
Total		\$27,000,000

B

To provide hangars and shops, flying fields and other facilities necessary for operations and experimental work.....\$25,000,000

C

For maintenance

Grand total

\$10,000,000

\$62,000,000

It is to be noted that in order to maintain this number of planes from year to year, and to provide for progressive experimental work, Items A and C would have to be appropriated for yearly, \$37,000,000.

Referring to this subject, an officer of high rank who has made an exhaustive study of modern naval warfare makes the following statement:

"If we had the strongest battleship fleet in the world it could not operate against any other country that is supplied with even a reasonable number of aeroplane carriers, with fighting and torpedo-planes. There are no means of resisting an attack from the air except by air forces. The one having the control of the air over the field of action will be the first to get its torpedo-planes against its enemy, and it is as easy to torpedo a battleship as it is to torpedo any other vessel. No reasonable number of battleships would be of any use to us unless they have their necessary auxiliaries."

This statement challenges contradiction. From abroad we have evidence of great improvements in Admiral Fiske's torpedo-plane—its deadliness against battleships has been demonstrated.

Manifestly another necessary "auxiliary" of the battle fleet is the submarine force. The surface, the submarine and the air forces must be co-ordinated to form a modern fighting fleet—it means a three-plane navy.

If the 1916 building program is not revised to meet conditions in 1921, Congress will seemingly be responsible for spending more billions for a fleet that cannot fight successfully under modern war conditions on the sea.—*Editorial in N. Y. Tribune.—The Aerial Age Weekly*, Jan. 24, 1921.

NAVAL AVIATION.—There is no bureau of naval aviation at the Navy Department, no control office, no one directing head having authority and

responsibility for the organization and development of an air force for the navy. Until such a bureau is established, it will be obviously impossible for the director of aviation to make headway. His hands are tied.

Aviation is distributed among several bureaus pulling in different directions, and nothing of real importance is being accomplished. An organization was submitted to the Secretary of the Navy in 1913, but he did nothing to establish it. To-day he advocates a bureau—seven years later!

The difference between army and naval aviation does not seem realized in Washington. But the material, the machines, the functions and the tactics cannot be the same in many respects in the army and navy. Army machines fly between points of land, start from the land and alight on the land, which is always stationary. Navy machines, on the other hand, must at times start from the sea or from ships that are moving, pitching and rolling, and they must sometimes land on a moving ship or in a rough sea.

Intelligence and organization at the Navy Department are imperatively demanded.

1. Establish a bureau of aeronautics.
2. Develop aeroplanes, bombing planes and torpedo-planes for naval uses.
3. Develop means for starting and receiving aeroplanes on the deck of a ship at sea or in the water alongside.
4. Build aeroplane carriers with a speed of thirty-five knots for service with the fleet.
5. Drill and develop the personnel of the naval air force to navigate and serve with the fleet.

There are individuals who know nothing of ships, seamanship or navigation who claim that a landsman aviator, with no naval training, can wrestle with naval conditions. It is preposterous!

A well-organized and efficient air force is vitally necessary in a modern fighting navy. It is fully as important as a submarine force. Without these two forces a surface fleet of dreadnoughts is powerless, offensively and defensively.

There is not one up-to-date long-range submarine in the United States Navy to-day. The United States naval air force is grossly inadequate. The condition is precarious.—*Editorial in N. Y. Tribune.*—*The Aerial Age Weekly*, Jan. 17, 1921.

ENGINEERING

MOTORSHIPS.—European shipbuilding nations, the Scandinavians at first, but now practically all, including England, France, Holland and Italy, in addition to Germany, have for some years been building large Diesel engines and auxiliary equipment for the driving of seagoing vessels. In more recent years this movement has been accelerated by the proved economy of the equipment that has been found most reliable and the reduction in cargo-carrying costs by the motorship over the steamship. The raising of all prices and costs by the war has directed attention to every possible source of saving, and this among other things has further increased the volume of motorship building at the expense of steamship construction.

During this whole period of experimental development of the propelling machinery, and with its perfection the large-scale demonstration of lower cargo carrying costs over competing steam equipment, America has done nothing with the motorship. On the contrary, there has been a great increase in steam cargo carriers, first as a result of war demands and later as a national movement for the reestablishment of the American Merchant Marine in a position of some commanding importance at sea.

While America has been building more and more steamships, the Europeans have been building fewer in proportion, replacing them by motorships, partly on the basis of demonstrated reliability but mainly on the

basis of proved reduction of operating costs. Only now have our shipping interests passed the period of consideration and entered upon that of action.

It has taken some years to convince American shipping interests that the motorship is reliable; it has taken some years to convince these same interests that America can build satisfactory engines and that they need not be reproductions of European models; but it can be said definitely that shipping interests have now reached the point of accepting this situation. It is admitted that American Diesel engines can be built equal in quality to those built in Europe and also at competing costs, but in spite of this there has not as yet been any great adoption of the motorship in this country. Only a few have been contracted for to-day, although a great many projects are under consideration.

Apparently American shipping interests have not yet been convinced of the superior operating economy and lower cargo-carrying costs of the motorship as compared with the steamship, especially when the latter is provided with the geared turbine Scotch-boiler type of equipment. At the present time the future of the motorship in American shipping activities seems to be hanging in the balance of these comparative costs of operation.

The motorship equipment costs materially more to buy than does the steamship equipment. Its fuel consumption is materially less the ratio at sea being 1 to $2\frac{1}{2}$ and still more favorable while in port. While there are corresponding differences in all of the other items of expense, such as wages and subsistence of crew, maintenance, repairs, stores, to mention a few of the leading items, it appears that the main elements of controversy and uncertainty lie in the balancing of the money saving by the motorship, due to fuel economy, against the excess of fixed charges which it must carry.

Whether or not the cheaper steamship, burning $2\frac{1}{2}$ times as much fuel as the motorship at sea, will give a lower or higher total cost of handling cargo per ton-mile, depends not only on the difference in the first costs, but also upon the prices of fuel per gallon, on the number of sea-miles per year of operation or horsepower-hours per year, or the ratio of time spent at sea to that in port; and in the case of the fuel on whether or not the motorship burns the same grade of fuel at the same price as does the steamship. For any given first-cost differential, constituting a fixed-charge handicap against the motorship, the money saving by the superior fuel economy of the motorship will be more than enough to offset it and show a net profit, provided the ship is kept at sea in actual cargo carrying a sufficiently large proportion of the total time. It will also depend on the fuel-price differential, as well as on the fuel price itself.

Analyses of these cost factors and totals indicate that the motorship is best adapted to long-distance voyages, the longer the better, and in this connection it should be noted that in the double-bottom bunkers of the motorship sufficient fuel can be carried for a total of 20,000 miles, which is much more than in the case of a steamship. The minimum length of voyage that can be profitably assigned to the motorship in competition with the steamship would seem to depend on the fuel-price differential, assuming the two ships do not burn the same grade of fuel.

As to fuel price, it seems pretty clear from what statistics are available that the general trend of price is upward, and that in view of the growth of the automotive industry this will continue so. This being the case, so far as forecasts are at all justified, it would seem fair to predict that, if anything, conditions in the future will favor the motorship more than in the past, because with a given saving in fuel per ton-mile by the motorship over the steamship, the money saved will be greater the higher the price of fuel.

The matter of price differential, however, is a disturbing factor. The Diesel engine has in the past consistently used a higher grade of fuel oil than has been burned under the boilers of the steamship and at prices ranging from 25 cents to 50 cents a barrel more than the steamer bunker oil

Due to the increase in the demand for light petroleum products for motor cars and similar uses, there is almost sure to be a greater differential in price between the lighter fuel that the motorship has been using and the low-grade steamer bunker oil than has been the case in the past. This would be serious, and the saving in the motorship would be wiped out if the differential were great enough, provided it were true, as some think, that the Diesel engine could not burn the lower grade of oil.

As a matter of fact there is no reason to believe that the Diesel engine cannot burn this low grade of oil except that so far it has not done so. It has not done so mainly because it is necessarily more troublesome, and so far it has not been necessary to take that trouble. It is quite clear, however, that when the price differential becomes great enough, it will be worth while to go to some trouble and expense to adapt the Diesel engine to this lower grade of fuel oil, or *vice versa*, and so wipe out the price differential entirely, which will restore to the motorship all of the advantages to which it is entitled.

To adapt the motorship to the burning of the lower-grade oil, which seems to be really the only step necessary to eliminate even the residual doubts remaining in the minds of American shipping interests, there are only two factors of any importance to be studied, namely, spraying of the oil and ignition temperatures.

It appears from all of the research work that has been done on spraying, particularly in connection with the spraying of oil in boiler furnaces with the so-called mechanical atomizers, that all oils can be sprayed equally well regardless of their other physical properties if they are brought by heating to the same viscosity. It would seem as if this should also be true when the oil is sprayed into a cylinder against a pressure of from 400 to 500 pounds per square inch, and some experimental work already done confirms this as a reasonable conclusion, though it is not yet a commercially established fact.

If the heavier residual fuel oils have, as may be the case, a higher ignition temperature than the lighter ones, there may be some difficulties about ignition at the compression which has been used for the lighter fuels. In this case two remedies are available: One to raise the compression, which has the objection of overloading the bearings, framing or the running gear and consequently increasing weights to avoid this; and the other to use an igniting fuel in small amounts, not exceeding 10 per cent of the total injected before the main supply of fuel, as has been done in Europe in burning tar oil. As soon as it appears to be necessary American engineers will undertake the building of the auxiliary apparatus and make the modifications necessary to adapt any grade of oil to the oil engine that can be fed through pumps from storage tanks, and thus wipe out any price differential that may exist, or may develop in the future, with every prospect of success. In general, whatever appliances are successful with one type of engine will be successful with all, because engine differences are not such as will prevent the general adoption of a broad scheme of fuel-oil conditioning developed for this purpose.

It may be said, therefore, that America is about to enter on its program of motorship development and use, and in fact has actually entered it within the last year. The rate of adoption depends upon the speed with which established facts become recognized and known, and are followed by building orders. It is of considerable interest to note that the motor-car industry, in which America now leads the world, developed in Europe in quite the same way as the motorship industry, and it is not too much to expect that once American interests become convinced that the motorship is what the Europeans think it is, American motorship construction and operation will also lead the world.—(Charles Edward Lucke.)—*Mechanical Engineering*, February, 1921.

WATER INJECTION IN GASOLINE ENGINES.—The practice of injecting water in conjunction with the fuel is quite common in kerosene engines, the object being to keep down the cylinder temperature under conditions of heavy loading and prevent pre-ignition. In fact, it seems very difficult to operate an Otto cycle kerosene engine and get satisfactory results without water injection. There also has been considerable experimentation with water injection (or induction) in gasoline engines, by makers of fuel conditioners and their customers, who believe that the injection of water will lessen or eliminate the formation of carbon deposit and increase the fuel economy.

In the development of aircraft engines, the suggestion was made that if water injection had these effects it should be beneficial in aircraft work. The problem was assigned by the National Advisory Committee for Aeronautics to the Bureau of Standards, and an extended investigation was made. The tests were carried out on a Class B military truck engine, and also on a Rutenber 6-cylinder, 3 x 5 inch engine, which operated at high jacket temperature. Although the investigation was made at the instigation of the Aircraft Department, the tests were conducted on a truck and an automobile engine, but the results, of course, are of general application.

The results arrived at have been summarized by the experts of the Bureau of Standards somewhat as follows: No appreciable effect is produced upon the power, fuel economy and general operation of a gasoline engine by the injection of water into the cylinders at rates varying from 0.03 to 0.44 pound per brake horsepower-hour. When water is injected at a higher rate than 0.44 pound per brake horsepower-hour there is an appreciable decrease in the power output, fuel economy and smoothness of operation. It is quite probable that in a badly carbonized engine, or an engine of defective design, in which there are hot spots that cause pre-ignition, the injection of the water results in an increase of power. In an engine operating at high waterjacket temperature the injection of water in amounts between two and eight pounds per hour produce a softening and slight reduction of carbon, this reduction not exceeding 25 per cent and being most noticeable in the piston heads and valves. However, water injection at the maximum rate also causes a considerable reduction of power.—*The Scientific American*, Feb. 5, 1921.

COLLOIDAL FUEL.—This subject was dealt with exhaustively in two papers by Mr. Lindon W. Bates, who devoted his attention chiefly to a general description of this material, and by Mr. Haylett O'Neill, who supplied more detailed information as to its properties and characteristics.

Mr. Bates outlined the origin and future possibilities of the colloidalizing process. Regarded from the economic standpoint the author says that the fuel possesses several advantages over fuel oil or coal alone. Briefly these are: Less liability to take fire; if on fire the flames may be quenched in and by water and, in storage, fire may be prevented by a water seal; greater calorific value than either of its components separately; it has greater combustion efficiency than straight oil, and, lastly, may be used in the usual oil-burning installations without material modification.

Mr. O'Neill described in detail the composition, uses, cost, etc., of the fuel. For commercial purposes the fuel contains 25 to 40 per cent pulverized coal, held in stable suspension in oil so that the product can be handled and fired with the usual oil-burning apparatus. The solid component may be coal, coke, charcoal, hard pitch, or any carboniferous substance capable of being ground. The fluid component will vary according to its availability in various countries. In England imported heavy petroleum oils are usable, with possibly the addition in certain cases of a thinning oil. Tar, and tar products in combination with oil, may be used where oils are more expensive.

Storage of the fuel may be in ordinary oil tanks, and its measurement accurately made by sounding pipes or depth gauges. The comparative specific gravities of coal, oil, and colloidal fuel, also its calorific value, are discussed, and by means of tables and charts the author shows that there are considerable advantages in favor of colloidal fuel, among which may be noted its stability in storage, low rate of evaporation, and immunity from the action of sea-water—a valuable point when stored in leaky ships' bunkers. In dealing with the transport of the fuel the author mentions that its characteristics as regards flow through pipe lines do not differ materially from crude oils; it is stated in general that the colloidal fuel is more viscous than its fluid component. Carbonizing at the burner tip is not greater with this than with crude oils, and in comparison with the greater number of heat units fired the possibility of slightly increased wear is negligible. Handling the fuel in the furnace is described, and, in connection with its combustion efficiency, it is stated that tests on sea and land prove that for steam-raising purposes it is at least the equal of oil. Mr. O'Neill enlarges upon the safety of the oil, and suggests its possible use as a protective wall around the power plant of a warship. Lastly, on the all-important question of economy, it is shown that by the use of colloidal fuel there is a gain of a few per cent on account of storage efficiency over straight oil, owing to its higher heat capacity per unit of volume and freedom from evaporation, but the big factor of economy is the saving in cost per given number of heat units over those of straight oil, on account of the coal component being so much cheaper than the oil.

The paper is accompanied by a number of charts and tables comparative of the properties of colloidal fuel and other fuels in liquid and solid form. (Lindon W. Bates, F. R. G. S., and Haylett O'Neill, papers read before the Institution of Petroleum Technologists, Nov. 16, 1920.)—*The Technical Review*, Jan. 4, 1921.

TWO GIGANTIC WATERPOWER DEVELOPMENTS.—The present high cost of fuel is not an unmitigated evil; for under the spur of necessity we are being driven to make use of other natural sources of heat and power than coal and oil, on a scale that otherwise might not have been attempted for decades to come. We have particularly in mind two power developments, one in England, and the other in the United States, each of which will be far greater in output than any waterpower plant at present in existence or contemplated. Of these, the British scheme is the more original, since it contemplates the use of the tidal power of the estuary of the Severn River. That the scheme is not visionary is proved by the fact that the investigations and plans have been drawn up under the British Ministry of Transport. Briefly stated, a dam $2\frac{1}{2}$ miles long will be thrown across the mouth of the Severn and in this dam will be installed hydroelectric turbines of a total of one million horsepower. The total fall of tide is thirty feet, and to secure a continual supply of current, 500,000 horsepower will be delivered direct to the line and the other 500,000 horsepower will be utilized in pumping water to a high level reservoir, which will supply hydroelectric turbines during the five hours in which the stage of the tide will prevent operation of the turbine plant in the main dam.

The American scheme contemplates the building of a dam 500 feet in height, which will impound 93 per cent of the flow of the Colorado River in a storage basin over 200 miles in length, impounding more than forty million acre-feet of water. The total hydroelectric development as thus provided for will be over four million horsepower. It is contemplated to distribute this power over country covered by a radius of 500 miles, and embracing eight of the western states. The gross hydraulic head of 3300 feet will be developed at four separate power stations, located along the course of the river. The scheme has been under investigation for several

years, and the application recently presented to the Federal Power Commission has been accepted.—*The Scientific American*, Jan. 25, 1921.

THE SCINTILLA MAGNETO.—In this magneto the magnet is mounted on the rotating spindle and rotates between laminated pole pieces attached to a stationary armature.

A compact arrangement of the windings has been obtained, built up on a laminated core. The contact breaker is stationary, the breaker cam only rotates, this being fixed to the same spindle as the magnet. There are no internal cable connections, all contacts being made by laminated copper plates. It is claimed that this magneto is absolutely waterproof. (*Motor Traction*, Nov. 1, 1920.)—*The Technical Review*, Jan. 18, 1921.

RADIO

AEROPLANE RADIO DIRECTION FINDING.—In view of the coming extensive use of radio direction finding in the air service in connection with cross-country flying, results of experiments conducted by engineering division, McCook Field, as to the accuracy that may be expected will be of interest to all branches of the air service.

Experiments were conducted by the engineering division during the past summer using radio as a means of assisting aeroplanes to return to the home aerodrome. Results of these experiments have shown that it is possible to guide an aeroplane with absolute accuracy to any radio transmitting station, and further that an experienced operator is not needed for this work.

The method used was that of two closed loops mounted on the wings of an aeroplane at right angles to each other, and operating upon a maximum signal. The particular installation used was mounted on a Curtiss *NJ-4-H* aeroplane, and consisted of two main or "fore and aft" loops of four turns each, connected in series, one loop being mounted on the outside struts of each wing. The auxiliary loop consisted of four turns of wire and was mounted at right angles to the main loops, struts numbers 4 and 10 being used. The fuselage of the aeroplane was enclosed by this loop. The wire was sewed into fabric and the strips of fabric were doped on to the struts and wings of the aeroplane. Leads were brought from the loops into the rear cockpit of the aeroplane and there connections were made to suitable switches, condensers, amplifiers, etc.

When flying at a height of 2000 feet it was possible to guide the aeroplane exactly over the transmitting station. This was done while allowing the man operating the switches in the rear cockpit to control the rudder, and thus steer the aeroplane as he desired. This experiment was tried both with experienced radio men in the rear cockpit and with men who knew absolutely nothing of radio and who did not know the Morse code. Results were the same in all cases—the aeroplane was brought directly to the transmitting station, no note being taken of the course steered from other than a radio standpoint. When flying at 2000 feet it is possible for the operator to easily detect when the aeroplane passed as small a distance as 100 feet from directly over the transmitting station.

These experiments do not embody any new departure in radio direction finding in aeroplanes. The method used was a part of the method brought out in England during the war, and which was to be used for navigating the Handley Page night bombers of our air service. These experiments are cited merely to show the degree of accuracy which may be obtained when using this method of radio direction finding for guiding aircraft.—*The Aerial Age Weekly*, Jan. 24, 1921.

RESONANCE COILS FOR RADIO.—Discovery of a new method of sending and receiving radio messages was announced recently by Major General Geo. O. Squier, according to *The Wireless Age*. Through development,

it is probable that wireless will be improved so as to permit the confining of messages to the parties directly interested. The discovery came about through investigations made early in the war on the uses of submerged bare wires. Out of it grew what is now known as a "resonance wave coil." Discussing some of the powers of the new invention, the scientists list the following: It is possible to locate an airplane in flight, to tell the direction of the flight, to tell how high it is flying and to tell by the use of two coils and mathematical deductions the distance of the airplane from the wave coils. The instruments can be used as range finders and in the same manner they can be used for airplane finding. Radio messages can be handled from airplanes without the trailing wires now used. Static interference can be reduced.—*The Scientific American*, Jan. 29, 1921.

THE USE OF COILS INSTEAD OF ANTENNÆ FOR WIRELESS RECEPTION.—This change has been made practicable by the development of cathode tube amplifiers. Important earlier research work in this direction by Professor Braun led to no practical result, as the necessary amplifiers were not then available.

The main advantages of receiving apparatus without antennæ are as follows:—1. The coil can be placed close to the ground. 2. The whole apparatus is very small and inconspicuous, and can be placed in any room. This advantage is of great military importance. 3. The apparatus is simple, light, and portable. 4. The directional effect enables strays to be easily eliminated. 5. Atmospheric interferences much lessened. 6. The direction of the sending apparatus can be accurately determined. 7. No more apparatus is needed with the coil than with antennæ.

The properties of receiving coils—or frames, as they are sometimes called—their dimensions and most suitable arrangement, are theoretically considered and experimentally confirmed. Five different methods of connection are described and illustrated. A special section is devoted to direction finding. (Dr. Ing. H. Hoffmann, *Jahrbuch Zeitschrift für drahtlose Telegraphie und Telephonie*, July, 1920.—*The Technical Review*, Jan. 25, 1921.)

MISCELLANEOUS

CHEMICAL DISARMAMENT.—Germany is still *Ueber Alles* in dye-production. Everybody who is interested in dyestuffs is concerned about this. The Allied nations are legislating about it, yet few realize that the balance and control of the dye industry is an essential factor in world disarmament. Dye-factories are chemical plants, and to turn their production from dyes to explosives and poison-gas is the work of a very brief period. V. Lefebure, formerly British liaison officer with the French forces, makes the assertion, in an article contributed to *Chemical and Metallurgical Engineering* (New York), that "chemical disarmament is the crux of all disarmament." All the more is this so because we can not disarm chemically by destruction. Guns may be broken up and forts dismantled, but we cannot destroy chemical industry, because it is essential to the arts of peace. In this case, Mr. Lefebure asserts, we must disarm by preventing monopoly. Distribute the chemical industries uniformly over the world, instead of concentrating them in Germany, and a menace to world peace will be removed. He believes that the Versailles Treaty contains the machinery for doing this very thing. He says:

"The League of Nations has instituted a definite commission to consider the question of world disarmament. A brief analysis reveals the fact that disarmament must cover three essential factors in warfare—the combatants, mechanical types of armament, and war-chemicals.

"Chemical armament, very generally, represents the actual death-dealing constituents of projectiles. This must, however, be qualified by the statement that the new type of chemical armament has become in some cases, and may increasingly become, independent of any special projectile. This

is a most important item from the point of view of disarmament. It means that the limitation of projectiles may not carry with it limitation of the chemical weapon.

"How do normal disarmament schemes apply to the chemical type? This type of weapon covers, roughly, two classes—explosives and the so-called poison-gases. They have one common characteristic. This is their peace-time use. This refuses to any disarmament scheme the right to disarm in the simplest fashion—that is, by the total destruction of producing capacity. The world must have for normal development a large producing capacity for explosives and for the other types of chemical armament. Germany produced practically every ounce of her hundreds of thousands of tons of poison-gas in dye plants. The infinitely flexible, almost instantaneously converted dye plants are a logical means of production of all organic chemical weapons, including explosives.

"We must now stop to lay emphasis on a general principle. There are two methods of disarmament. In the first class you can disarm very simply by destroying all the means of production and preventing their renewed growth. In the second class, because the means of production—the factories—have a peace-time function, you cannot disarm by destruction. How then, can you disarm in this case?

"There is only one way—it is to insure that no one country possesses a monopoly in the means of production. The brightest and most telling war-chemical invention has no value for and no incidence upon warfare unless it can be produced rapidly and in quantity. Production is the key to its war-use. Let us examine very briefly, therefore, the world distribution of the means of production for this new type of weapon. Before the war Germany held the almost absolute monopoly of world organic chemical production. Through this monopoly she launched the poison-gas campaign, and for more than two years the Allied reply was relatively feeble. This was not due to Allied lack of invention, but to lack of producing capacity.

"During the war, however, for economic rather than military reasons, dye-producing industries sprang up in France, America, and England. Their development was relatively feeble, owing to numerous obvious reasons. From the point of view of our argument this development left the world in the following situation regarding organic chemical-producing capacity:

"The German dye industry, the source of her war-chemical production, was considerably strengthened. Other countries were left with promising but relatively feeble organic chemical resources which could not immediately, even under normal commercial conditions, hope to break the German monopoly. In other words, although for most types of armament the pre-war balance in favor of Germany was decreased, yet for this one type of chemical armament the German monopoly was strengthened."

We are, therefore, declares Mr. Lefebure, left in face of the following situation: For most types of armament the war has led to a redistribution of producing capacity in the direction of an equilibrium. By diminishing this capacity and controlling and inspecting we may obtain international disarmament; but in chemical warfare, the final situation is just as remote from equilibrium as before. The conclusion is obvious. The world must have organic chemical-producing capacity, but it cannot tolerate a monopoly held by those who so drastically abused its possession. There must be a redistribution before we can claim to have even approached disarmament. It would be farcical to proceed with general disarmament schemes and to leave this untouched. In other words, we must break the German monopoly. He continues:

"How can this be achieved? There are two main avenues of approach. The new-born dye industries of France, America, and England, and if you wish, other countries, must be supported nationally through legislation and internationally through some such organization as the League of Nations.

"In America and England legislation designed to protect the dye industry is before both countries. The issue is likely to be fought out on purely national grounds. This alone is entirely unsatisfactory. It must be realized by all concerned that they are legislating on a matter which has infinitely more than commercial significance. They are legislating on world peace.

"Chemical disarmament is a matter which, unfortunately, non-technical people do not fully understand. They think it sufficient to issue an edict against the use of poison-gas, not realizing that this alone is absolutely futile as an effective measure. You cannot prevent any discoveries in chemical warfare, because, unlike the development of mechanical invention, such chemical discoveries can occur, when directed by a trained mind, with the mere use of a few pots, pans, beakers, in any unguarded and unsuspected locality. The redistribution of producing capacity is therefore critical.

"Article 168 of the Treaty of Versailles provides for the restriction by the Allied and Associated Powers of the manufacture of war-material and the approval of those powers for the continued existence of factories and works for such production in Germany. On these grounds it is logically possible to limit seriously that capacity of the German dye industry which produce poison-gases during the war and may continue to do so. Article 169 provides for the surrender to the Allied and Associated Powers of any special plant intended for the manufacture of military material, except such as may be recognized as necessary for equipping the authorized strength of the German Army. The execution of this clause, if a proper interpretation of chemical armament be used, would imply the closing down of many of the German dye plants which produced those huge quantities of poison-gases during the war.

"We repeat that the crux of all disarmament is the redistribution of organic chemical capacity throughout the world. This is, without any doubt, one of the most important measures now before the world, and, in addition, one of the few measures with regard to which immediate action can be taken toward the stabilization of world peace."—*The Literary Digest*, Feb. 12, 1921.

THE LEAGUE AND DISARMAMENT.—To quote a well-worn phrase, disarmament is the acid test of the League of Nations. But if that body is powerless to settle a minor issue such as the disposal of the German cables, which is causing so much friction as between the United States, France, and Japan, how can it suggest anything practical in a matter involving the life of nations? Consequently there was a sad consciousness of an adverse world in the speeches at Geneva in discussing the report of the committee in connection with the fulfilment of Article 8 of the Covenant. This provides for a reduction of armaments. But up to the present almost nothing has been effected. In theory the Assembly is still hopeful, but admits the tremendous difficulties which will have to be surmounted before anything practical is accomplished. Not only do naval and military powers stand outside the League, but the economic and financial situation is such that it would be almost impossible to adjust national budgets to any fixed standard. Most of the speakers admitted that the ideals of the League and the realities of the world are not capable of adjustment by the action which has been taken. All it amounts to is a recommendation to the Council to submit for the consideration of members of the League a preliminary scheme for a kind of two years' military holiday in naval and military expenditure. What kind of reception will this proposal of the League, modest as it is, meet in Paris, Washington and Tokyo, not to speak of London? Not a very friendly one. In these circumstances the British representatives, Mr. Fisher and Mr. Barnes, merely beat the air when they indulge in optimism. The first said that the "limitation of armaments is an object which can be achieved with comparative ease." Only on paper.

Otherwise the burden would have been lifted long ago. This kind of reasoning is not helpful, and when we carefully refuse to make recommendations or to bind ourselves in any way, other nations are inclined to doubt our sincerity. Mr. Barnes, on the other hand, thinks that the committee which deals with the question has shown "too much prudence and too little pluck." But he omits to enlighten us any further. If only the League would be content to go slowly!—*The Army and Navy Gazette*, Dec. 25, 1920.

SAILING VESSELS.—The author refers to the comparative cost of ocean cargo transport by steamers and sailing vessels, and points out the economic limit beyond which the former do not constitute a profitable means of transport.

A diagram shows the cost of engine power, based on cost and consumption of coal per horsepower, covering the period between 1800 and 1920, and the limit for steam-driven cargo vessels. Coal has proved too expensive during three periods, the first from 1800 to 1843, when sailing vessels were exclusively used; the second from 1853 to 1881, when sailing vessels again came into their own; while the third period commenced in 1912 and still continues, as goods can be carried far more profitably in sailing vessels. It is pointed out that the present type of clipper-built six-masted schooner is very much more economical than the old-fashioned full-rigged ship, because it is much easier to handle, attains a higher speed, and sails much closer to the wind. In fact, it only fails during periods of calm weather, which are not very frequent.

The author proposes to build six-masted schooner clippers of 5000 tons capacity, fitted with oil motors to be used only during calm weather. Such ships would have a sail area of 36,600 square feet. The masts would be of uniform height and provided with gaff sails of equal size to be operated with electric winches in order to require a minimum of attendance. Vessels of this type are increasing in number in Scandinavia and Germany, and have been able to make long voyages at an average speed of seven knots. Their owners report a return of 70 per cent on the capital expended, or nearly twice the amount from the best class of steamers using superheated steam in up-to-date engines. (C. O. Liljegren, *Industritidningen Norden*, Sept. 24, 1920.)—*The Technical Review*, Dec. 28, 1920.

RHINE-MAIN-DANUBE SHIP CANAL.—The linking up of the North Sea with the Mediterranean by a trans-continental waterway was discussed in the court of Charlemagne in 793, and a commencement made, although subsequently abandoned.

A canal connecting the Main with the Danube was actually constructed in 1836 by the Bavarian Government, but only for barges of 126 tons capacity. It has more than 100 locks, and is much too diminutive for modern transport requirements. The Bavarian Parliament voted five million marks in 1917 towards the cost of a new Main-Danube Canal, which is to connect northern Bavaria with the Danube, and to be suitable throughout for ships 233 feet long by 33 feet wide, with 7 feet 3 inches draft, viz., 1200 tons burden. It is, in addition, to accommodate vessels of 1500 tons burden, viz., 279 feet long by 33 feet 6 inches beam, from the Danube to Aschaffenburg.

The total length of the proposed canal necessary to join the three rivers, including the length of the canalized river Main and Regnitz, is 451 English miles. The total rise to be negotiated above sea level is 1340 feet, requiring 60 locks. It is hoped to transport 12 million tons annually, the average time of transit to be 145 hours.

Hydro-electric power to the extent of 168,500 horsepower, yielding 936 million kw. annually, will also be available.

The estimated cost of the canal is 597 million marks (nominally £30,000,000). The annual expenses are detailed, and the national gain by way of decreased cost of transport is valued at £1,800,000 annually. (*Das Technische Blatt*, June 26, 1920.)—*The Technical Review*, Jan. 25, 1921.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Germany's Air Aims. *The Literary Digest*, Jan. 22, 1921.

A New German War-Prophet. *The Literary Digest*, Jan. 22, 1921.

Lubrication. *Engineering*, Dec. 31, 1920.

The German Giant Gun. *The Engineer*, Dec. 31, 1920.

Naval and Commercial Shipbuilding in 1920. *The Engineer*, Jan. 7, 1921.

The Future of Warships. *Engineering*, Jan. 7, 1921.

Aeronautics in 1920. *The Engineer*, Jan. 7, 1921, *et seq.*

Coming Aeronautical Developments. *The Engineer*, Jan. 14, 1921.

The Development of the Aero Engine. *Engineering*, Jan. 21, 1921.

NOTES ON INTERNATIONAL AFFAIRS

FROM JANUARY 10 TO FEBRUARY 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

GERMAN REPARATION TERMS

ALLIES FIX AMOUNT OF REPARATIONS.—The amount and the method of payment of the reparation to be demanded of Germany were agreed upon at a conference of Allied Premiers and financial experts held in Paris during the last week of January. The total reparations payment was fixed at 226 billion gold marks (about 55 billion dollars) payable in 42 annual instalments. The plan was outlined as follows:

First—In forty-two years Germany shall pay to the Allies the sum of 226,000,000,000 marks in gold, or its equivalent, on this scale—2,000,000,000 marks annually in 1921 and 1922, 3,000,000,000 marks annually in 1923, 1924 and 1925, 4,000,000,000 marks annually in 1926, 1927 and 1928, 5,000,000,000 marks annually in 1929, 1930 and 1931, and 6,000,000,000 annually from 1932 to 1962.

Second—Germany shall pay to the Allies for forty-two years an annual tax of 12 per cent upon the total of her exports.

Third—Germany shall revise her interior fiscal system, balancing her budget and curtailing the issue of paper money, increase her taxes generally, raise the imposts upon alcohol and tobacco, and increase railroad fares and postal rates.

Fourth—In case Germany does not fulfill these conditions the Allies have the right to seize the German customs, impose direct taxes in the Rhineland and otherwise exercise financial control upon Germany. In addition military penalties will be provided.

By this plan the period of 31 years for payments fixed by the Versailles Treaty was increased to 42, a change requiring German consent. The amount of 269 billion marks fixed by the earlier Boulogne Conference was somewhat reduced, but this was compensated for by the proposed 12½ per cent tax on German exports. The returns from this tax are difficult to estimate; it was recognized that the tax would be actually paid by foreign purchasers, and that it would serve like a protective tariff to keep up high prices.

CRITICISM OF REPARATION TERMS.—Mr. J. B. Keynes, author of *The Economic Consequences of the Peace*, declared on January 30 in the *Manchester Guardian* that the amount required of Germany was "double the highest figure that (to my knowledge) any competent person here or in the United States has ever attempted to justify." Washington authorities were reported as adhering to the view that Germany could not pay more

than 10 billion dollars plus interest. An American expert pointed out that there were only two policies possible: (1) a reasonable indemnity, with restrictions on Germany's access to foreign markets, (2) a larger sum, with full opportunity to Germany to engage in foreign trade while Allied countries decreased production. The second method appeared far less desirable.

On the other hand, the French Finance Minister, Louis Loucheur, on January 18 declared that German complaints were largely "bluff," and that she could pay 10 billion francs annually, four-fifths of it in coal, without crippling German industry. He pointed out further that the German Government was feeble, and that taxation and railroad rates were lower than in Allied countries.

GERMANS AGREE TO DISCUSS TERMS.—After two stormy meetings, the German Cabinet on January 31 decided to send delegates to the proposed meeting in London, in the effort to persuade the Allies that the terms demanded were impossible. On February 8 a note was dispatched to Premier Briand of France accepting the invitation to the London Conference on March 1 "on the supposition that negotiations would take place also on propositions the German Government intends to present to the conference."

BRIAND GETS VOTE OF CONFERENCE.—After four days of heated debate the French Chamber of Deputies accepted the Paris Reparations Terms by a vote of 395 to 83, and gave its support to the Briand Ministry by a vote of 387 to 125. Premier Briand eluded all efforts to pin him down to a definite promise not to recede from the Paris terms. He declared that agreement among the Allies came first, and that France could not act alone. It was evident, however, that any weakening in London on the indemnity terms would mean the downfall of the Briand Ministry.

CONFERENCE SET FOR MARCH 1.—The London Conference is to be held on March 1. Lloyd George, Briand, Count Sforza and Jaspar will represent Great Britain, France, Italy and Belgium. Japan will be represented by one of her ambassadors, and Greece is to send a representative, and in this connection it should be noted that Gounaris, who has been notoriously pro-German, would not be acceptable to the Allies as the Greek delegate.

Besides Germany, Turkey is to send a representative. Information has reached London that in addition to the Sultan's delegation from Turkey, which is proceeding overland, Mustapha Kemal is coming to London by sea, via Brindisi. With two rival Turkish delegations present, a curious situation may result.—*N. Y. Times*, Feb. 9, 1921.

OCCUPATION COSTS REDUCED.—Count Sforza, Italian Foreign Minister, in announcing the results of the Paris Conference, revealed the decision that the expense to Germany for Allied occupation forces was to be reduced to about \$60,000,000, or one-sixth of the present cost. It is estimated that this saving of \$300,000,000 annually for a possible period of 15 years would nearly offset the proposed 12½ per cent tax on German exports.

REVISION OF TURKISH TREATY.—It was announced from Constantinople on February 6 that Mustapha Kemal would either come himself or send delegates to the London Conference on March 1, in which the Turkish problem will be taken up. The Constantinople government will also be represented. Greece decided to send her new Premier, M. Kalogeropoulos, who succeeded M. Gounaris at the beginning of February. The decision to revise the Treaty of Sevres meant a victory for French policy, which has favored coming to terms with the Turkish Nationalists rather than allowing Greece to retain her present concessions in Asia Minor.

PROPOSED CANCELLATION OF ALLIED LOANS.—Much interest was aroused in the United States by the statement of J. Austen Chamberlain, Chancellor of the British Exchequer, that Great Britain had approached the United States with proposals for a general cancellation of debts owed among the Allied and Associated Powers. As shown by the following statement, Great Britain would lose by such an arrangement, though less heavily than the United States. Secretary of the Treasury Houston later stated that one nation had made such a proposal, but that it had not been favorably received by the American Government.

UNITED STATES

Owed to by Allies.....	\$9,580,000,000
Owed by to Allies .....	.....
Balance lost	<u>\$9,580,000,000</u>

GREAT BRITAIN

Owed to by Allies.....	\$8,335,050,000
Owed by to Allies.....	<u>4,620,550,000</u>
Balance lost	<u>\$3,714,500,000</u>

FRANCE

Owed to by Allies	\$1,645,185,000
Owed by to Allies.....	<u>7,508,635,000</u>
Balance gained	<u>\$5,863,450,000</u>

MANDATE TERMS PUBLISHED.—The mandate terms for Mesopotamia and other areas thus disposed of by the Versailles Treaty were published in the London press at the close of January. It is understood that the publication of these terms, prior to their submission to the American Government, was not relished by the American State Department, and was taken as evidence that the powers which control the League of Nations had determined to take their own course in the government and exploitation of mandate territory without permitting the participation of the United States.

It was stated on February 9 that the British reply to Secretary Colby's note of November 20 on the nature of mandates and control of oil and other rights in mandate territory, would soon be delivered, and that the British and the American Governments would then publish all the correspondence on this question.

PALESTINE UNDER BRITISH MANDATE.—At the time of the publication of the Mesopotamian Mandate, the terms upon which Great Britain will take a mandate over Palestine were also made public. According to these terms Great Britain assumes control of the foreign relations of Palestine, protection of its inhabitants abroad, and imposition of taxes and customs, while the inhabitants are to be given "the widest measures of local self-government consistent with prevailing conditions." Evidently while Palestine is to be a home or refuge for Jewish people who may wish to seek shelter there, it is not to take on the character of a nation.

GREAT BRITAIN

EFFORTS FOR IRISH SETTLEMENT.—No satisfactory results followed the conferences in London during the first week in January between the British Ministry and Father O'Flanagan, representing the Sinn Fein. Early in February, following conversations between Premier Lloyd George and Sir Edward Carson, rumors were circulated of a plan to persuade South Ireland to accept the Home Rule Bill by offering full fiscal autonomy to both sections of Ireland. It was reported that concessions of this character would go far toward reducing Irish opposition, and that the Sinn Fein leaders had agreed to negotiate on a "Dominion" form of government fulfilling the following requirements:

1. Acceptance of the partition of Ulster.
2. Full fiscal autonomy.
3. Full amnesty for all "rebels," regardless of the charges against them.
4. Withdrawal of British troops from Ireland.

MAYOR OF CORK IN AMERICA.—Mayor O'Callaghan of Cork, Ireland, arrived in Norfolk, Va., early in January, as a stowaway, having taken this means of coming to America to testify before the Villard "Committee of One Hundred" on Ireland. As he had entered the United States without a passport, the State Department ordered his immediate deportation. The Department of Labor, however, ruled that he should be considered as having the status of a seaman. Upon receipt of seaman's papers he was able to remain in this country until the completion of his activities and then take ship for Ireland.

AMBASSADOR GEDDES VISITS ENGLAND.—In the middle of January the British Ambassador to Washington, Sir Auckland Geddes, made a short visit to England. It was understood that his journey was for the purpose of informing the British Government and the Supreme Council regarding the attitude of the Harding administration on the League of Nations and other outstanding questions involving the United States and Great Britain, including the Irish question, mandate terms, disposal of former German cables, canal tolls, Japanese negotiations, treatment of British subjects in Mexico, tariff and trade, and reduction of armaments. The ambassador returned in February with definite information as to the policy of his government in these matters.

FRANCE

BRIAND HEADS NEW MINISTRY.—Following the resignation of the Leygues Ministry early in January, an unsuccessful attempt was made by Raoul Peret, President of the Chamber of Deputies, to form a new cabinet. The task then fell to the veteran Aristide Briand, who on January 16 announced the completion of a slate, with Louis Loucheur as Minister of Finance. M. Briand is rated as one of the best statesmen of France, and was premier from October, 1915, until March, 1917. His policy toward Germany is less uncompromising than that advocated by ex-President Poincaré. In outlining his policy to the French Chamber, he insisted upon disarmament and reparation on the part of Germany, to be enforced peacefully if possible, but by force if necessary; non-intervention in Russia, provided the Soviet army did not take the aggressive; reduction of military service without weakening the force available so long as Europe remained unpacified; general economy, and indulgence towards the working classes.

RUSSIA AND POLAND

POLAND SEEKS FRENCH AID.—Marshal Pilsudski, President of Poland, with the Polish Foreign Minister, Prince Sapieha, arrived in Paris on February 3 and left two days later after conferences with the French Ministry. The object of the Polish leaders was three-fold—to secure if possible military and financial assistance from France and a commercial treaty similar to that recently concluded between France and Czechoslovakia. As regards financial aid, France could promise little, and gave only a vague assurance that the matter would be considered after the settlement of the German reparation problem. The French Ministry also realized that French troops could not be forced to serve against Russia on Poland's eastern frontiers, though the Rhine forces would guarantee Poland against German aggression. It was thought that a commercial agreement would be negotiated by which France would extend credits to Poland in return for a preferred position in the Galician oil fields.

In the course of the conferences the following declaration was issued:

“On the occasion of the visit of President Pilsudski, the governments of France and Poland agreed upon the following declaration:

“‘The governments of France and Poland, equally anxious to safeguard their security and the peace of Europe, have recognized once more the community of interests uniting these two friendly countries.’”

POLISH-RUMANIAN ALLIANCE.—The Polish Ministers in Paris did not fully admit the existence of a defensive alliance between Poland and Rumania, but declared that a Russian attack on Rumania would at once involve Poland. Before leaving Paris, Marshal Pilsudski gave assurance that the irregular Polish troops now occupying Vilna would be withdrawn upon the arrival of the international forces to be sent there by the League of Nations.

PRESIDENT WILSON ON RUSSIA.—On January 18 President Wilson despatched a note to the President of the League of Nations acknowledging

a note from the League dated December 26 which suggested that the Armenian question be laid before the American and Allied commissioners at Constantinople. This course President Wilson regarded as impracticable, but agreed that direct negotiations would be futile in view of Armenia's acceptance of Soviet protection. The President declared the Armenian problem could be considered only as an element in the disturbed condition all along Russia's frontiers, and in the following passage proposed that the powers should make an effort to define these frontiers and then agree to leave Russia alone so long as she kept within these bounds:

The unrest and instability along the border are caused by bitter and mutual distrust. The struggling new nationalities, which were formerly part of the Russian Empire, are afraid to disarm and return to the works of peace because they distrust the Bolsheviki and fear new aggressions. The Soviets contend that they are afraid to demobilize because they fear new attacks.

The great impediment to peaceful reconstruction in those troubled border territories, the imminent danger of new hostilities is caused by the utter confusion between offense and defense. Unless this distinction can be clearly defined there is not only small hope of peace, but no hope of a clear perception of who is responsible for new wars.

It is, therefore, the thought of the President that the present moment offers a peculiarly pressing challenge to an attempt at general pacification on the Russian borders along these lines. Such an attempt seems to the President the logical outgrowth—in fact, the only logical development—of the request to mediate in the Armenian conflict, and he feels bound in conscience once more to call this matter to the attention of the associated nations.

It is obvious to all that these small struggling states will not attack great Russia unless encouraged by promise of support from the stronger powers. The President therefore believes that the *sine qua non* of an attempt at pacification must be a public and solemn engagement among the great powers not to take advantage of Russia's stricken condition and not to violate the territorial integrity of Russia, nor to undertake themselves any further invasions of Russia, nor to tolerate such invasions by others.

Such a public agreement would in effect say to those now in power in Russia:

"You are not menaced from outside. The great powers have voluntarily guaranteed you from attack. You can have peace if you want it."

The responsibility for any new war which might break out on the Russian border would then be clearly placed.

If the principal powers represented on the Council of the League find themselves in accord with the President in this matter and will assure him of their moral and diplomatic support, he will instruct his personal representative, Mr. Morgenthau, to proceed at once on his mission.

NORMAN H. DAVIS.

BORDER STATES RECOGNIZED BY ALLIES.—On January 27 word was received in Washington that the Allied Supreme Council had decided to extend *de jure* recognition to Latvia and Esthonia, and had given intimation that similar recognition would later be accorded to Lithuania and Georgia. This action was regarded as a definite rejection of President Wilson's proposed policy that the dismemberment of Russia should not be given final sanction at this time. The recognition of independent states on the western frontier of Russia would, it was thought, have a dangerous

reflex in Asia by affording Japan a pretext for promoting the severance of all political ties between Siberia and European Russia.

SOVIETS LOOK TO TRADE WITH AMERICA.—London, Feb. 1.—Leonid Krassin, who recently returned to Moscow from London where he acted as Russian Soviet Trade Commissioner, declared in an interview that it may be supposed, after the conclusion of a commercial treaty between Russia and Great Britain, that America will enter trade relations with Soviet Russia, although the American line of action will only be made clear after the final transfer of the Presidential power to President-elect Harding, says a Moscow wireless message to-day.

Krassin, the message adds, pointed out the importance of creating a great stock of goods for export, on which he said the whole matter of Russian trade exchanges with the western countries depended.—*N. Y. Times*, Feb. 2, 1921.

SOCIALISTS DIVIDED ON BOLSHEVISM.—According to a press account of January 25, the Socialist parties in various countries are seriously divided over the "twenty-one conditions" prescribed by Nicolai Lenine as determining whether these parties shall be received into the Third or Communist Internationale of Moscow. Lenine's chief demands were that the Socialist organizations should "purge themselves of all moderates, defy all national laws, undermine armies, gain control of the press, throw off the allied yoke, promote a world economic crisis, condemn any league of nations, aid the Soviet Government, and abandon all conservative Social Democratic programs."

Of the 15 nations where the Socialists have taken action, four have been against entering the Internationale, one undecided, four divided, and six in favor in spite of strong minority opposition. The American Socialists declared the right to decide upon their own internal policies. The German Independent Socialists at Halle last October voted 237 to 156 in favor of joining. The French Socialists in December split into three factions over the question. In Italy the conditions were rejected by a large vote, but the minority seceded to form an Italian Communist Party.

UNITED STATES AND JAPAN

NEGOTIATIONS WITH JAPAN CONTINUED.—It was announced on January 26 that the report of Ambassador Roland S. Morris, embracing recommendations for a settlement of outstanding issues between the United States and Japan, had been completed and submitted to the U. S. Department of State. The report was identical with that sent by Ambassador Shidehara to Japan, and covered the results of five months of conversations between the two ambassadors. Its proposals were as follows:

1. An amendment of the existing commercial treaty between Japan and the United States so as to grant to Japanese subjects lawfully in this country equal rights with the nationals of any other foreign nation.

2. A revision of the existing "gentleman's agreement" between Japan and the United States so as to make it conform to present-day requirements, and to that end absolutely prohibit Japanese emigration to America and Hawaii while admitting Japanese immigrants into the Philippines.

It was regarded as unlikely that any definite proposals would be submitted to the Senate by the Wilson administration. The Senate Committee on Foreign Affairs on February 9 requested that the State Department furnish an outline of the Ambassador's proposals.

SHOOTING OF LIEUT. LANGDON.—After the killing of Lieut. Warren J. Langdon, U. S. N., in front of the Japanese headquarters at Vladivostok by a Japanese sentry, the United States Government at once sent a note of protest. The Japanese reply promised a thorough investigation and inclosed a copy of an order to present similar offenses. The American Naval Court of Inquiry exonerated Lieut. Langdon from any blame in connection with the affair.

BORAH DISARMAMENT PROPOSAL.—On January 20 the U. S. Senate Committee on Foreign Relations reported favorably the Borah naval disarmament resolution. As reported, the resolution did not stipulate 50 per cent reduction in five years, as in the original form of the resolution.

The final form of the resolution was as follows:

As reported out by the committee the disarmament resolution reads:
“*Resolved*, by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States is requested, if not incompatible with the public interests, to advise the governments of Great Britain and Japan, respectively, that this government will take up directly with their governments and without waiting upon the action of any other nation the question of naval disarmament, with a view of promptly entering into a treaty by which naval building programs of each of said governments, to wit, that of Great Britain, Japan and the United States, shall be reduced annually during the next five years to such an extent and upon such terms as may be agreed upon.

“Section 2. That this proposition is suggested by the Congress of the United States to accomplish immediately a substantial reduction of the naval armaments of the world.”

In spite of the Borah proposal, the Senate Naval Committee on February 9 endorsed the report of the Naval General Board for continuation of the Naval building program and condemned any suspension of construction as costly and unwise.

JAPANESE FOREIGN POLICY.—The address of Foreign Minister Uchida at the reopening of the Japanese Diet in the latter part of January was a detailed review of Japanese foreign policy.

Speaking of mandates for Pacific islands, Viscount Uchida said:

“When the terms and formulæ of mandates came up for determination a difference of views arose between the Japanese and British governments on the construction of the treaty stipulation relating to the terms and formulæ of the mandate over former German colonies lying south of the equator. Agreement could not be reached for a long time.

“A frank exchange of views, however, between the Japanese and the British representatives who attended the first session of the League Assembly happily resulted in composition of difference. While agreeing to the terms of the mandate of C Class, as proposed by Great Britain, the Japanese Government came to a full understanding with the British Government that Japan should make a declaration to the effect acquired rights of Japan

in former German colonies south of the equator should be fully respected and that their agreement to the terms of the mandate over these islands should not be taken to signify acquiescence on the part of Japan in any discriminatory and unfavorable treatment of her nationals in said islands.

"Accordingly, when the terms of Class C mandates were decided upon the 17th of December at a meeting of the eleventh session of the League Council, the Japanese representatives made a declaration on the lines of the above understanding and reserved for Japan the right to resume negotiations with the British Government concerning the treatment of Japanese subjects in the territories affected. The terms and formulæ of the mandates over former German possessions in the South Pacific having been determined, the Japanese Government is about to enter upon formal control and administration in pursuance of the terms of the mandate over the group of islands assigned.

"As to the revision and renewal of the Anglo-Japanese agreement of alliance, the Japanese Government has been giving careful consideration to the question with a view especially to its relation to the covenant of the League of Nations. They entered into conference with the British Government and a frank exchange of views on this matter took place both in London and Tokio.

"In view of Article VI of the existing agreement of alliance, it was decided to address the League of Nations a joint notification to the effect that the governments of Japan and Great Britain had come to the conclusion that the Anglo-Japanese agreement of July 13, though in harmony with the spirit of the covenant of the League of Nations, was not entirely consistent with the letter of that covenant and that they accordingly recognized in principle that, if said agreement was to be continued after July, 1921, it must be in form not inconsistent with the covenant. Notification was conveyed in a note dated July 8, 1920."

As to China, Viscount Uchida recommended the consortium plan, and continued:

"At a time when the powers interested are thus joining their hands to promote the welfare of the Chinese people by avoiding needless competition among themselves and by further strengthening their friendship and concert it is a matter to be openly deplored, especially by Japan, who as her neighbor is peculiarly interested, that complete and peaceful unification of China is not yet in sight.

"Last summer when the political situation of China began to give signs of further complication and later when things came to such a pass that the northern part of China became involved in armed conflicts the Japanese Government issued timely warning to their officials and nationals in China to refrain from any acts or activities that might be regarded as taking part in political strife, and a declaration was also published defining their policy of scrupulous impartiality and their attitude of strict fairness. The situation in China is now at the turning point and the awakening of the people is indeed worthy of note.

"When Czechoslovak troops had withdrawn from Trans-Baikalia the Japanese Government, consistent with their repeated declarations, withdrew their troops from that region. In districts around Vladivostok, whence menace to the peace of Korea was still felt and where the safety of many resident Japanese had to be provided for, and in Khabarovsk, which is the point of strategic importance on the way to the Province of Saghalien, we had to keep sufficient forces until such time as tranquillity was restored in these regions. As soon as the situation around Khabarovsk began to show a degree of stability we withdrew our troops from that district in September last.

"The political situation of Eastern Siberia underwent various vicissitudes during the course of the last half year. There were in existence since last spring four local governments at Vladivostok and other centers. The time gradually became ripe during last fall for amalgamation of these local

political bodies until in November last what is called the Amalgamation Assembly was held at Chita. This Assembly decided for the independence of the Eastern Republic. Chita was chosen for seat of central government and various political bodies were relegated to a position of local autonomy. It was also decided that the Constitutional Assembly should be held on the 25th of January.

"As a result of this amalgamation, the Provisional Government of Vladivostok turned its authority over to the Central Government about the middle of last December. The government of the Far Eastern Republic claims to stand for anti-Communitic democracy and has declared itself in favor of friendly relationship with foreign countries, especially with its near neighbors. What the new government may do in practice is for the future to reveal.

"The political stability of Russia in general is earnestly hoped for by Japan as her good neighbor, while as for Siberia in particular it is the keenest desire of the Japanese Government that this troubled area should be unified on a sound basis and be restored to complete order."—*N. Y. Times*, Jan. 25, 1921.

MEXICO

OIL SOLUTION SOUGHT.—On January 12 another protest was sent by the American State Department to Mexico regarding patents to Mexicans issued by the Mexican Government covering oil rights to parcels of land owned by American interests. Several such patents were issued in the closing days of President de la Huerta's régime.

On February 7, President Obregon appeared in person before a special session of the Mexican Congress. In his message he requested immediate solution of the oil question, which had "assumed an international character of grave aspect," and declared that the solution should if possible be such that "both the government and the oil men may be satisfied."

REVIEW OF BOOKS

"L'Escadre Allemande du Pacifique." By Paul Ardoin, Enseigne de Vaisseau de Reserve. (Published by Augustin Challamel, 17 Rue Jacob, Paris, France.)

This book was written while the author was in a German prison camp. Consequently, he had access to various German accounts of the cruise of Von Spee's Pacific squadron.

The publishers explain in a foreword that the author's death prevented them from calling his attention to certain passages that might be considered as reflecting adversely on the work of the Allied navies. Consequently, they published the book as originally written, explaining the fact that it was derived from German sources.

However, it is difficult to consider the book in any way as a eulogy of the German Navy. Rather it appears to be a very fair-minded and well-written history of the career of Von Spee's squadron in the Pacific, concluding with the final destruction of the vessels at the Battle of the Falkland Islands. True, tribute is paid to Von Spee's character, as well as to that of Von Muller, the captain of the *Emden*. Still I believe it is universally admitted that these men were worthy adversaries and brave seamen.

The narrative begins with the description of the vessels stripping ship in the Caroline Islands immediately after the declaration of war between Austria and Serbia. Shortly after this Von Spee learned that Germany had declared war against France and Russia. The admiral and his captains fervently hoped at this time that England would not engage in hostilities, for it was not difficult for them to foresee that England's entry into the war could not but result in the loss of all of Germany's colonies, thus depriving the squadron of any base.

Soon after it was learned that England had declared war, Von Muller, captain of the *Emden*, recommended that the squadron disperse and individually attack enemy commerce in different areas. Von Spee did not follow this suggestion altogether, but he did detach the *Emden*, and that vessel set out on her venturesome career.

From the Carolines the rest of the squadron proceeded to the Marshall Islands where the news was received that Japan had also declared war. This made the admiral's position all the more desperate, rendering as it did the return to an Asiatic base very precarious. The admiral then sent the *Nuremburg* to Honolulu for supplies and information; and shortly after that vessel left Honolulu, occurred the very dramatic incident of the destruction of the cable station at Fanning Island.

The Allies, finding it impossible for the time being to locate Von Spee's squadron and bring it to action, captured the German colonies, one by one.

Von Spee proceeded to the Society Islands where it seems almost incredible to realize that the governor did not recognize the ships as German, before delivery of supplies had actually been made.

The book continues with a very interesting account of the successful defense of Tahiti by a young French lieutenant, resulting in Von Spee's decision to refrain from attempting to land.

Early in October the admiral learned that Sir Christopher Craddock's squadron had been sighted at Punta Arenas. Von Spee proceeded to the Easter Islands, where he found that the governor did not know that a state of war existed between Germany and the Allies. Consequently, once again supplies were obtained without trouble.

After leaving the Easter Islands, a radio was received from a German agent in Chile to the effect that one of Craddock's ships, the *Glasgow*, had coaled at Coronel. Shortly afterwards Von Spee sighted the enemy off the Chilean coast and cleared for action. The engagement lasted only 54 minutes. The German forces were superior and they had the tremendous advantage of the weather gage. The *Good Hope*, Craddock's flagship, was sunk and the subsequent destruction of the *Monmouth* by the *Nuremburg* is graphically related.

Then follows an account of the enthusiastic welcome given the squadron by the German colony at Valparaiso. Yet even amidst this cheer, Von Spee realized that his squadron could not long survive with Germany shorn of her colonies. Of course, however, he scornfully rejected the suggestion that he should intern at Valparaiso.

Foreseeing difficulty in obtaining supplies in the future, the admiral decided to leave the Pacific. With the idea of obtaining stores at Port Stanley, the capital of the Falkland Islands, he put in there to encounter to his great surprise Admiral Sturdee with his battle cruisers. Sturdee's success in bringing his ships across the ocean unknown to the German Intelligence Department was, of course, one of the most brilliant feats of the war.

The author quotes Sturdee's official report of the Battle of the Falkland Islands, calling attention to the fact that this sea fight resembled a series of individual ship engagements rather than a concerted fleet action. The Battle of the Falkland Islands falls naturally into three phases, namely: the action against the German armored cruisers, the action against the light cruisers and finally against the transports. Of all of Von Spee's ships the *Dresden* escaped, only to meet destruction later in the channel where she had sought refuge. The final pages of the book describe the end of the *Dresden* and the interning of the *Prinz Eitel Friederich* at Norfolk.

The author's style is easy; the narrative is interesting, and the book is especially recommended for the officer who desires to improve his knowledge of French and at the same time review this phase of naval history.

N. R. V. X. V.

"Our Air Force—The Keystone of National Defense." By William Mitchell, Brigadier General, Air Service. (Published by E. P. Dutton Company.)

This volume, written by an officer who has had wide experience in aviation, is of particular interest, as it deals with a subject of supreme importance at the present time. In his discussion of the work of Army Aviation during the World's War, the author is at his best. He brings out clearly not only the usefulness of aviation as a military arm, but also the importance of the coordination of this arm with the other agencies utilized in war for applying military force. General Mitchell points out plainly the necessity for the development of civil aviation as a vital factor in national defense, also the importance of furthering the advance of aeronautics through the creation of airdromes, an improved meteorological service, and the upbuilding of an industry for the construction of aviation apparatus.

There is much in the book, however, which may be objected to by one who reads carefully and who would take issue with the cheerful, optimistic, imaginative enthusiast who has done a great deal to promote the activities of American aviation. The sailor first may be inclined to take exception to strategy as it is touched upon in places, where it appears that the defense of homeland against attack or invasion is dwelt on particularly, and the fact that adequate defense of a country comprises not only the defense of territory but the furtherance of the foreign policies of the government, which implies an ability at times to apply force from positions far beyond local frontiers. With these matters the navy always has been particularly concerned, and it can hardly be expected that one who has not had experience in naval affairs can treat these subjects in accordance with the naval idea.

His description of the employment of heavier-than-air machines and of personal experiences are of great interest, but the reader of historical narratives dealing with the war will take issue with the general in his discussion of lighter-than-air ships. The author's conclusions concerning the reliability and the employment of Zeppelins during the World's War and of their future usefulness are not at all in accord with the statements of Admiral Von Scheer, who remarks that

"Probably no arm of any service has suffered such severe losses as our airships, with the exception of the U-boats. Out of 61 Zeppelins which were assigned to the Fleet in the course of the war, 17, with their whole crews, were destroyed by the enemy. . . .

"Twenty-eight airships were lost through stranding and other accidents, such as the burning of sheds in consequence of explosion. The crews of these were all saved, though in six instances they were made prisoner. Six ships had to be placed out of service as being useless; at the end, ten were still left in a condition fit for use.

* * *

"Their main task was scouting. That is why they were retained during the war as a weapon by the navy; the army had no use for them. The

development of the aeroplane produced a keen competitor and a dangerous opponent. The Flying Service could not, at first, overcome the difficulty of covering the great distances which scouting at sea entailed. It was a question of flying over large sea areas, such as the North Sea, and providing the fleet with trustworthy information and reports. Flights of 24 hours and longer had to be reckoned with, and no flying man could hold out for so long.

* * *

"Another very painful setback for navigation by airships occurred in January, 1918, when, owing to the spontaneous combustion of one of the airships in Ahlhorn, the fire spread by explosion to the remaining sheds, so that four Zeppelins and one Schütt-Lanz machine were destroyed. All the sheds, too, with one exception, were rendered useless."

Von Scheer sees great possibilities for the commercial airship, but considers that its usefulness in the future as a military machine is slight.

In the discussion of overseas aviation, there are numerous details with which the sailor will not agree. General Mitchell remarks that scouting over the water is easy as compared to over-the-land work of this kind. He refers presumably to the operation of seeing only, but visibility such as that with which he deals is not oftentimes encountered overseas in Northern latitudes. There are numerous other details in connection with scouting which are of interest and which cannot be neglected, notably that of knowing one's own position, that of the enemy when once he is discovered, and the position of one's supporting forces. In this detail, the operator on land usually may fare far better than can the sailor.

The author speaks of the possibility of dispelling fog, which is something for which the sailor has ardently hoped for centuries.

In dealing with naval operations of the future, the author passes lightly over many difficulties which have been sources of concern to the navies of the world for years. His unfamiliarity with the naval problem and naval weapons is evident. One is never inclined to take issue with a progressive prophet, but the thought is ventured, however, that it will be some time before naval vessels begin to battle with guns at ranges of 40,000 to 60,000 yards, as implied by the author, and the speed of 40 knots proposed by General Mitchell for huge carriers, however possible, is a gait yet to be attained by a large sea-borne craft.

Details to which naval men will object are the deductions made by the general as to the usefulness of aviation at the Battle of Jutland. His statement that "In the Battle of Jutland, German airships practically saved the German fleet" is not supported by Admiral Von Scheer, the German Commander-in-Chief, who indicates that, while it had been planned that the German Fleet should be well covered by aircraft in making the sortie which terminated in the battle, such was not the case because of an unfavorable weather condition "which was quite unsuitable for airships." In the operations preceding and leading up to the battle, German aviation accomplished nothing. On June 1, 1916, the day after the battle, the five airships that had gone out during the night endeavored to scout, but conditions continued to be unfavorable. One airship made contact, but was

compelled to retire and lost "sight of the enemy in a thick atmosphere." At 8.00 a. m. this vessel was dismissed by the commander-in-chief and returned to Nordholz at 2.00 p. m. One other airship, the *L-24*, sighted certain destroyers but found it "impossible to keep in contact for further reconnaissance as there was a bank of cloud as low down as 800 meters." It is difficult to understand how a military man could err so greatly in his historical references as has been done by the author in this instance.

On page 191 of his book, the general states "it is maintained by competent naval authorities that one airship saves two battle cruisers to a fleet. A battle cruiser to-day costs about \$45,000,000 completely equipped." Admiral Jellicoe reported that under favorable conditions an airship was the equivalent of two *light* cruisers, but the bald statement of the general cannot be confirmed.

The possibility of using the great rigid as a transport for troops and for supplies, as proposed by General Mitchell, is of interest. It remains for the future to disclose the feasibility of so doing.

In dealing with naval weapons and their employment, the author makes statements which are not clear and which the sailor cannot readily understand; for example, on page 170, in discussing the torpedo, he writes as follows:

"Their specific gravity is almost the same as that of water so that if they are launched from any height they immediately sink."

This reason for failure is not evident to those who have concerned themselves for years with the development and the operation of the complicated mechanism of the torpedo. Perhaps because of his unfamiliarity with its possibilities, General Mitchell is inclined to slight the usefulness of the torpedo as a weapon.

There are many other details in which the sailor, or the sailor aviator, will not agree with the conclusions reached by the author, but on the whole the book is of interest as an optimistic treatise on the possible and probable useful development of the most recent and wonderful arm which science has placed at our disposal, the application of which is now to be worked out in connection with that of other military and naval branches.

T. T. C.

"Simsadus." By John Langdon Leighton, formerly Ensign, U. S. N. R. F. 170 pp. Published by Henry Holt and Company, with about 55 charts and illustrations. Price \$4.00.

A very interesting and instructive account of the operations of the U. S. Naval Forces in Europe, the cable address of the headquarters of which the author takes as his title. Service on the staff of Admiral Sims in London, on the *Leviathan* and in the Brest "Suicide Squadron" of converted yachts gave the author unusual opportunity of observation and of obtaining valuable data. He covers all phases of our participation in the war, and the activities of vessels from sub. chaser to dreadnought, both in explanation of the method of operation and in interesting details of individual ship action against the enemy.

The book begins with the situation in April, 1917, when this country entered the war and Admiral Sims' arrival in London, then deals with the establishment of bases and the gradual amplification of our forces and the effect upon the submarine campaign of our greater efforts. The chapters on "Submarine Operations" and "The Destruction of Submarines" are particularly good. The reason given for Germany's failure to sink transports is unique, though his facts seem to prove his theory. The last chapter is an appreciation of Admiral Sims.

An appendix contains interesting tables showing the numbers of submarines sunk and where sunk, also the names of the captains. The book is of interest even to those who were intimately connected with the operations in Europe and to whom much of the information given is already known.

B. C. A.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,

Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- "Rebuilding the Navy's Enlisted Personnel, and Recestablishing Its Morale and Spirit After the Serious Slump Caused by Too Rapid Demobilization and High Wages in Civil Life."
- "The Human Element in the Administration of Discipline."
- "A Demobilization Programme for the Future."
- "The Mission of the Naval Academy in the Molding of Character."
- "Health of Personnel in Relation to Morale."
- "Physical Factors in Efficiency."
- "The Naval Officer and the Civilian."
- "Naval Bases, Their Location, Number and Equipment."
- "Military Character."
- "The Ability to Handle Men a Necessary Element in the Equipment of a Naval Officer."
- "The Relation of Naval Communications to Naval Strategy."
- "The Relation of Naval Communications to Naval Tactics."
- "The Training of Communication Officers."
- "The Organization of a Naval Communication Service."
- "The Naval Policy of the United States."
- "A Review of the Battle of Jutland with Lessons to be Learned Therefrom."
- "Modification in the Design and Armament of Ships to Meet the New Conditions of Aerial and Subsurface Attack."
- "Coordination of Surface, Subsurface and Aerial Craft in Naval Warfare."
- "Our New Merchant Marine."
- "Submarine Warfare, Its History and Possible Development."
- "Escort and Defense of Oversea Military Expeditions."
- "A Proposed Building Programme for the U. S. Navy, Including an Efficiency Air Service."
- "Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation."
- "The Ship's Company—Its Training, Discipline and Contentment."
- "The Principles of Leadership of Naval Personnel."
- "Morale Building."
- "The Value of Facility in Exposition—Verbal and Written—for Naval Officers."
- "Discipline as Affected by the Human Relation."
- "The Value of Pep."
- "Navy Spirit—Its Value to the Service and to the Country."
- "The Influence of the Term of Enlistment on the Efficiency of the Service."
- "The Principles upon which Should be Founded the Freedom of Neutral Shipping on the High Seas."
- "The Fighting Fleet of the Future."
- "The Future of the Naval Officer's Profession."
- "The Navy: Its Past, Present and Future."
- "The Navy in Battle: Operations of Air, Surface and Underwater Craft."
- "Shall I Remain in the Navy?"
- "Psychology and Naval Efficiency."
- "The Naval Policy of the United States in the Light of the Peace Treaty."
- "Scope of Naval Industrial Activity and the Navy's Relation to Shore Industry."
- "The Pacific Theater."
- "Was Germany's Coast Impregnable?"
- "Future Development of the Naval Shore Establishment."
- "America as a Maritime Nation."
- "Arguments for and against the Restriction of the Manufacture of Munitions to Government Owned Factories."
- "The Present Rule of Neutrality regarding Contraband and Blockade—Is it Justifiable in Ethics or in Expediency?"
- "The United States Navy and the League of Nations."
- "Is a League of Nations Navy Desirable?"
- "The Adaptability of Oil Engines to all Classes of War Vessels."
- "The Place of Mines in Future Naval Warfare and the Rules under which Their Use Should be Allowed."
- "The Use and Abuse of the Doctrine of Continuous Voyage."
- "The Question of the Future Use of Submarines."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

'MAIS IL FAUT CULTIVER NOTRE JARDIN.' Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery. Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N.
NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellfcott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

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CONTENTS

SEA POWER AND AMERICAN DESTINY. By Herman F. Krafft, Associate Professor, U. S. Naval Academy.....	473
LEADERSHIP OF MEN. By Captain F. B. Upham, U. S. Navy.....	487
SLIDE RULES FOR NAVIGATORS. By Captain Armistead Rust, U. S. Navy.....	497
MORALE FOR OUR "NEW NAVY." By Ensign (T) R. E. Krause, U. S. Navy	519
THE PRACTICAL NAVAL OFFICER. By Rear Admiral Wm. S. Sims, U. S. Navy, President, Naval War College.....	525
AN INTRODUCTION TO THE USE OF NOMOGRAMS OR ALIGNMENT CHARTS. By Commander G. L. Schuyler, U. S. Navy.....	547
DISCUSSION	559
SECRETARY'S NOTES	575
PROFESSIONAL NOTES	577
NOTES ON INTERNATIONAL AFFAIRS	627
REVIEW OF BOOKS	636
INFORMATION INDEX	576

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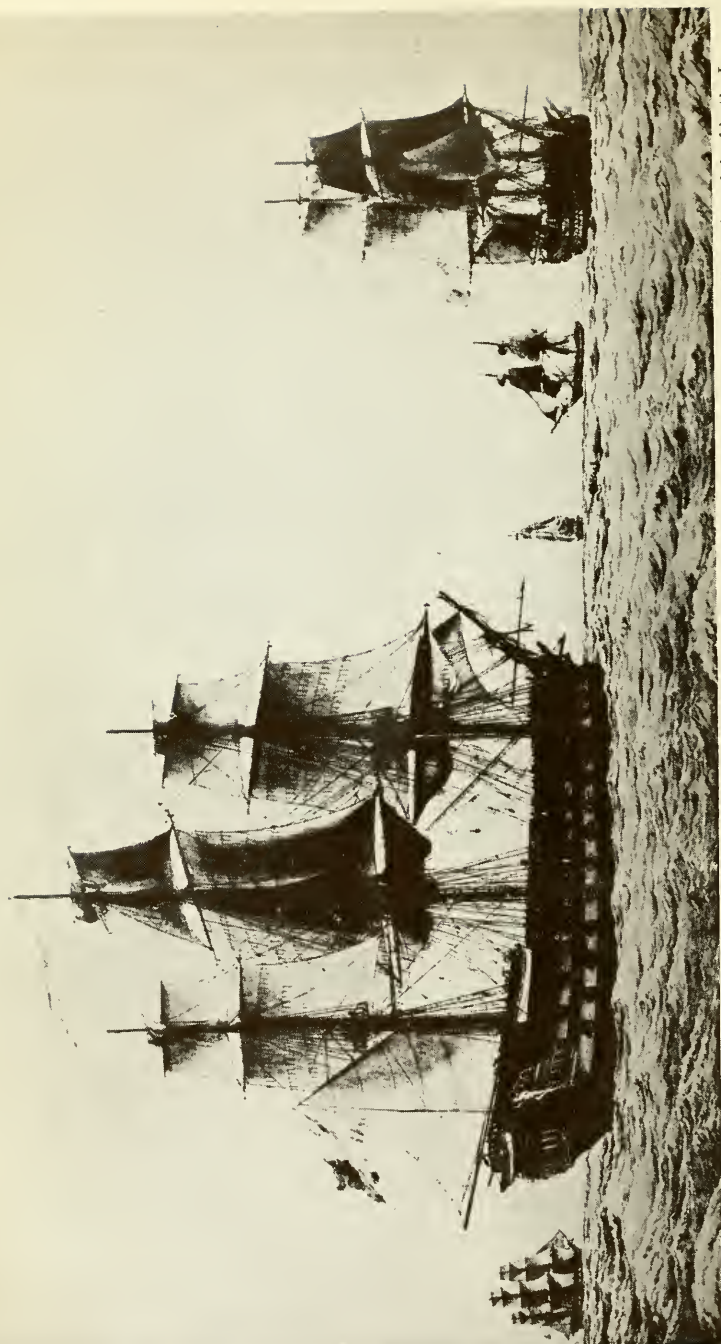
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MEN OF WAR A CENTURY AGO.

Types of ships-of-the-line, frigates, and sloops of war, in which great sea fights like Quiberon Bay and the Capes of the Chesapeake, for America as prize, were fought.

From the original in the Louvre.

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SEA POWER AND AMERICAN DESTINY

By HERMAN F. KRAFFT,

Associate Professor, United States Naval Academy

In seven of the eight wars waged by the United States since 1775, navies had, to borrow a phrase of George Washington, "the casting vote." Perhaps more exactly we should say that in these seven wars sea power—rather than navies alone, which form only one element of sea power—was, in the last analysis, the decisive instrument. Transmarine wars would be impossible without the transference of armed forces to the theater of operations and without the continued maintenance of the communications of such forces. These communications are the functions of navies and merchant marines. To borrow a trenchant phrase of Admiral Mahan, "Communications dominate war."

Sea power, as used by naval writers, is a wider term than military navies. It may be defined as the combination of all those means which a nation can bring to bear to gain and keep control of the sea. It embraces therefore such factors as a location with good harbors on great waters facing the highways of commerce; a productive, commercial, and sea-faring population to furnish the means of trade, and the artisans and sailors to build and man commercial and naval fleets; colonies to exchange products with, to furnish coaling, repair, supply stations, and ports for fleets to operate from against enemies and to seek refuge in; and finally a

navy proper to weld together and protect this whole combination of production, commerce, trade routes, bases and colonies. Great Britain, which has all these elements, has been for centuries and is to-day the best illustration of sea power.

Before we consider the influence of American sea power as a decisive instrument in American history, let us take a glance at the influence of British sea power in winning North America for the Anglo-Saxon race. America, which was discovered by the aid lent to Columbus by the greatest sea power of his time, Spain, was lost to Spain by the rise of a greater sea power, Britain. The defeat of the Armada, 1588, wrested from Spain the control of the seas and paved the way for English colonization of North America. A century later, under Cromwell and William of Orange, British sea power defeated another rival, Holland, and by its superiority at sea was able to acquire the Dutch colonies and trade in North America and so to unite the Atlantic seaboard from Maine to Florida under the British flag. Finally after another century British sea power defeated a third rival for America, France. As a result of this crushing victory over France in the Seven Years' War, England got by the Peace of Paris, 1763, all of North America east of the Mississippi River. This great result was brought about not only by England's navy, but still more by her vast commerce, which then as in later wars furnished the support for great coalitions against her enemies. In a war of attrition, Great Britain, leaning heavily on her commerce and colonies, could wear out the most powerful combinations against her.

In this Seven Years' War, the sea power of the American Colonies had an important and decisive influence. These colonies, which had till within half a century before been dependent on the mother country for food, were now able from their great surplus to export grain for the support of the mother country. With a commerce carried in five hundred and fifty American bottoms and with vast fisheries the colonies financed the war to a large degree. The reader will recall Burke's glowing tribute in Parliament to the extraordinary growth of colonial commerce which, he says, had reached a total in 1770 equal to half of England's at this time, and to the whole of England's seventy years before. Of the American fisheries—an important result of colo-

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FOR

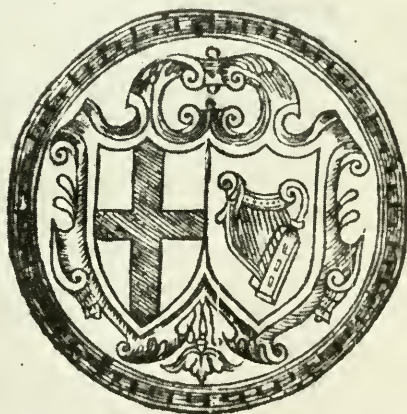
Increase of Shipping,

And Encouragement of the

N A V I G A T I O N

OF THIS

N A T I O N.



Thursday the Ninth of October, 1651.

O Rdered by the Parliament, That this *Be forthwith Printed.*
and Published.

Hen: Scobell, Cleric. Parliamenti.

*London, Printed by John Field, Printer to the Parliament
of England. 1651.*

From the original in the New York Public Library.

TITLE PAGE OF CROMWELL'S NAVIGATION ACT.

The corner-stone of England's sea power, a prolific cause of wars, for example of the American Revolution and the War of 1812. This act, which required all British imports and exports between England, Asia, Africa, America, and to a less degree from the continent, to be in British bottoms, remained in force for 200 years.



THE CONSTITUTION.

The ship which more than any other inspired respect for American sea power in the early days of the republic.

“Aye, tear her tattered ensign down,
Furl every threadbare sail,
And give her to the god of storms,
The lightning and the gale.”

—*Old Ironsides*, Holmes.

nial ship-building and trained sailors, and therefore a factor of sea power—he says:

Look at the manner in which the people of New England have of late carried on the whale fishery. . . . We know that whilst some of them draw the line and strike the harpoon on the coast of Africa, others run the longitude and pursue their gigantic game on the coast of Brazil. No sea but is vexed by their fisheries; no climate but is not witness to their toils. Neither the perseverance of Holland, nor the activity of France, nor the dexterous and firm sagacity of English enterprise ever carried this most perilous mode of hardy industry to the extent to which it has been carried by this recent people; a people who are still, as it were, but in the gristle, and not yet hardened into the bone of manhood.

What colonial sea power, therefore, had helped the mother country to wrest from the French in 1763, colonial sea power, aided by French sea power, wrested from the mother country a score of years later. The French felt keenly the humiliation of the Treaty of Paris of 1763, and accordingly plotted in and out of season to force Britain to relinquish the fruits of her victory. If France could not win back America, she was determined that England should not keep it. Her diplomats made skilful use of the growing discontent in the American Colonies. The celebrated French author of "The Marriage of Figaro," Beaumarchais, secretly sent vast stores of munitions, tents, and uniforms to the struggling colonies. In the two critical periods of the American Revolution, American sea power played the decisive rôle in one and French sea power in the other.

During this war there were two strategic battles and only two, Saratoga and Yorktown, in each of which navies had, to borrow Washington's term again, "the casting vote." In the fall before the battle of Saratoga, Benedict Arnold fought with the British on Lake Champlain, the water route and therefore in those days the only route to New York, a lake action with row galleys, "a battle of pigmies for a continent," as Mahan calls it. Arnold won in this respect, that he forced the British to postpone their invasion of the colonies for a year and so gave the colonials a chance to concentrate during the winter for defense the next spring. Hence, when the British renewed the attempted invasion under Burgoyne in 1777, the colonials were ready, as they were not the previous year, and Burgoyne's whole army surrendered—a direct result of Arnold's tiny naval force. The second battle, Yorktown, was likewise made decisive by the help of sea power—a help which

Washington acknowledged in the most generous terms.¹ The American general with superb strategy had kept, through a scout frigate, in close communication with the French Admiral DeGrasse. By reason of the most careful co-operation so arranged, DeGrasse managed to outwit the British admirals on the coast. He appeared off the capes of the Chesapeake at the psychological moment and was able to keep at bay the British Admiral Graves coming to the relief of Cornwallis, whose communications were entirely dependent on the sea. The result, as we all know, was the surrender of Cornwallis at Yorktown and the end of the war for America. What Americans do not always realize in this battle is the vital importance of the sea fight off the capes between DeGrasse and Graves, an indebtedness to France far greater than that for Lafayette's help—an indebtedness that we can the more generously acknowledge now that the debt has been repaid. Of course the little American Navy under such men as Barry, Wickes, Conyngham, and especially under John Paul Jones, helped a great deal in harrying British commerce. But with the last three of these commanders again the debt was great to France, for she helped very much, at first secretly, and after 1778 openly, in making their harassment of the Mistress of the Seas decisive. For it was during these middle years of the American Revolution that the French-Spanish fleet for the first time in many years held a temporary control of the English Channel. Therefore, to sum up, we must acknowledge that sea power, colonial and especially French, was the decisive factor in the battles of Saratoga and Yorktown and won for the colonies their independence.

The United States, thus aided by French sea power to its independence, was early in the administration of Washington called upon by France to repay the debt by means of American sea power. The French Revolution, beginning in 1789, was to last for twenty-six years and was to bring the United States into

¹ For example, in his letters to DeGrasse of October 20, 1781, and of October 28, 1781, from which the following two excerpts are taken. For complete letters see Ford, "Writings of George Washington," ix, 389, 399:

"The surrender of York (town), from which so much glory and advantage are derived to the allies, and the honor of which belongs to your Excellency, has greatly anticipated our most sanguine expectations."

"Your Excellency will have observed that, whatever efforts are made by the land armies, the navy must have the casting vote in the present contest."

armed conflict with each of the two great belligerents and also with the Barbary pirates before the quarter of a century of European wars ended. Four years after the beginning of the revolution, in 1793, England and her sea power were once more aligned against France. The British Navy had, after the American Revolution, won the battle of Saints' Passage and so reasserted its control of the sea. As in other periods, the British Navy, leaning on its vast sea resources, had quickly rejuvenated itself after its spell of deterioration. Thus at the outbreak of war, Britain's control of the sea forced France to a privateer war. The new French Republic sent a Von Bernstorff in the person of Citizen Genet to the United States to buy supplies for France and to operate privateers from American ports against British shipping. Genet bullied the Republicans into sympathy with France and tried, but unsuccessfully, to bully Washington in his brazen interference with American neutrality. Under Genet's intrigues relations with Great Britain became so strained that Washington sent Jay to England, who negotiated the treaty bearing his name, 1794, by which the United States practically agreed not to allow its merchant marine to carry supplies to France. As the latter's merchant marine had been driven from the seas, she had tried to substitute American bottoms to carry on her West Indian-French commerce. She had been attempting to make neutral America render service which she herself, not having control of the sea, could not render for herself. Great Britain by reviving her rule of 1756 maintained that America in thus carrying on France's commerce was acting practically as a belligerent. Jay's Treaty ended this illicit trade and so caused France to retaliate by seizing American merchantmen in the West Indies. The young American republic, forestalling trouble with Algiers and other pirates, had built the nucleus of a navy in 1794 in the construction of the frigates *United States*, *Constitution* and *Constellation*. With this naval force the United States in 1798 to 1800 convoyed American merchantmen to and from the West Indies and captured several French cruisers. This so-called "Naval War with France" ended when Napoleon took control of France, who signed a new treaty of peace with the United States. America, under the wise guidance of Washington, who believed in no entangling alliances with either belligerent, had been desirous of maintaining a strict neutrality; it was willing to sell goods to either belligerent. Un-

fortunately for France, as for Germany in 1914, England had control of the sea, and therefore the neutrality of the United States, however strict it might be, could help only the belligerent controlling the highways of commerce. In this short naval war with France, therefore, the young navy of the United States prevented the preying on American shipping by the weaker European belligerent and upheld the neutrality and the dignity of the United States. American sea power, unaided by armies, won this second war in our history.

Shortly after the war with France, American sea power, again unassisted by armies, waged a decisive contest with the pirates of Tripoli, 1801-1804, a contest that resulted from the great European war. America, whose trade at this time was second to England's, was carrying on an extensive commerce in the Mediterranean, where British trade was handicapped by a split-control ended by the great sea fight of Trafalgar in 1805. The Barbary pirates took advantage of the general disorganization in Europe and also of the jealous connivance of the British, who secretly fostered the depredations of the Barbary corsairs against their American trade rivals in the Mediterranean. By the brilliant exploits of American officers like Preble and Decatur, Tripoli was brought to terms, and the system of extortion, blackmail, tribute paying, and white slavery, tolerated for centuries by the civilized nations of Europe, was ended by the long reach of a young sea power three thousand miles away. Even Britain, with all her boasted mastery of the seas, had not been free from tribute paying to these nests of corsairs. After the Napoleonic wars England sent a powerful expedition under Lord Exmouth to Algiers and so ended piracy and white slavery in Barbary States forever. But American sea power had blazed the way.

We have now seen that the United States was drawn into two purely naval wars—the "French War" and the Tripolitan War—by the general chaos of the Napoleonic era in Europe. We must note in passing also that these two American wars were waged in the interests of neutrality and of freedom of the seas. But the sea power of the United States was to be forced to defend these same principles of neutral rights and free seas a third time during the Napoleonic wars. In this instance—the War of 1812—the sea power of the United States was to be pitted against the second of the two great belligerents of the Napoleonic era—against the Mistress of the Seas.

Just as the causes of the former two of these three American wars were based on depredations on the American merchant marine and were decided by sea power, so this War of 1812 was naval in origin and in its decisive features. As the American reader remembers only too well, the causes of the War of 1812 were illegal seizures and searches of American merchantmen and impressment of American seamen. In order to neutralize Napoleon's paper blockades of the British Isles and commerce, and in order to thwart Napoleon's Continental System, by which he tried to keep English products out of Europe, and thus destroy the great sea revenues of the coalitions against him—in other words, in order to maintain British commerce as the sinews of war and at the same time to deprive Napoleon of these limitless resources—England went to such extremes in regulating ocean traffic that she by her orders in Council coerced all neutral trade to her ends or drove it off the seas. Hence American commerce, which during the years 1807 to 1810 at times exceeded Britain's tonnage, was slowly but surely being driven from the seas by the violence and cupidity of both Napoleon and Great Britain. True, this annihilation of American commerce was unintentionally abetted by the President and Congress of the United States by the latter's restrictions on American trade, which helped to embargo it to death. These restrictions and British and French depredations in their ultimate effects not only ruined thousands of American ship owners but brought suffering and unemployment to greater thousands and changed the whole character of New England from a commercial to an industrial community. But, as in the recent World War, the depredations on property, while ruinous, did not touch the hearts of the people as the outrages on human liberty and lives. For Great Britain in her hour of need, in the struggle against the world dictator, a struggle that had already lasted twenty years, wanted men for her great marine and navy, and accordingly her officers boarded American merchantmen and even war ships and seized ruthlessly thousands of American citizens. This was the wrong that Americans of a hundred years ago felt more keenly than the mere loss of property. Great Britain was then, as a century later, really fighting with back to the wall against a great would-be world conqueror, but the people of the United States were blind to this fact by recent memories of George III's tyranny. As Mahan points out, Amer-

ica a century ago should have fought Napoleon, not England. But the wily Napoleon professed to have very "delicate ideas of the rights of non-combatants at sea, whither his power did not reach." He seized American ships wholesale without right or reason, just as he made of peoples on the continent tribute-paying Belgians. But impressment was to the Americans of that day a more flagrant abuse of human rights than seizure of ships. It was to them somewhat like the ruthless disregard of human rights a century later by the German U-boats, and like the latter had a greater influence in forcing a pacific government and people to take sides against England rather than against the worse aggressor, Napoleon. After years of diplomatic note writing the American government declared war on June 19, 1812.

The War of 1812, therefore maritime in its origin, depended also on sea power for its decision. The United States entered the war—owing to the pacific ideals of the people and government—unprepared. We had an insignificant naval force of fourteen frigates and sloops of war, as against five to six hundred ships of the line and frigates in the British Navy actually in commission. But partly to make up for the lack of a national navy, the American people quickly transformed the idle American merchantmen into privateers, of which there were five hundred and twenty-six before the end of the war, whose depredations on British commerce had a considerable effect in the final peace. While the fourteen national warships in the American Navy won undying fame for themselves in their ocean duels with the *Guerriere*, *Java*, *Macedonian*, *Frolic*, *Shannon*, etc., under such leaders as Hull, Bainbridge, Decatur, Jacob Jones and Lawrence, still the odds of fourteen to a thousand were too great to influence the military result. The overwhelming British superiority in the Atlantic gradually blockaded the United States so tightly that hardly a fishing smack dared show itself even in its own Chesapeake Bay, which the British turned into a base from which their sailors and soldiers harassed the coast towns and burned the American capital.

But while American sea power on the ocean could do little but win glory in an unequal contest, on the Canadian border things were different. Here, after humiliating defeats to the raw American troops, the American Navy prevented a disastrous defensive. Perry by his victory on Lake Erie, September, 1813,

regained control for communications on the American left wing and forced the retirement from the Northwest of the British right wing. A year later, September, 1814, Commodore Macdonough by his crushing naval victory on Lake Champlain achieved what Mahan declares the decisive engagement of the war. This battle of Lake Champlain determined, even more than the first battle of Lake Champlain during the Revolution, the strategy of the war. For immediately upon the victory, Prevost, the Governor-General of Canada, with his fourteen thousand veterans from Wellington's army, retreated precipitately into Canada. The battle had a far reaching effect on the peace makers at Ghent, for it ultimately forced England to give up her demands on United States territory in Michigan and Maine. Moreover the decisive influence of these lake battles—that is, of sea power—on the war is seen from the following reply of Wellington, the conqueror of Napoleon, who in the emergency in Canada was asked to take command over here:

Neither I nor any one else can achieve success, in the way of conquests, unless you have naval superiority on the lakes. . . . The question is, whether we can obtain this naval superiority on the lakes. If we cannot, I shall do you little good in America; and I shall go there only to prove the truth of Prevost's defense, and to sign a peace which might as well be signed now.²

After the War of 1812 the setback suffered by the American merchant marine from the Napoleonic Wars crippled the sea power of the United States for half a century. For the navy too this period was one of stagnation and deterioration. Farragut complained in 1839 that our navy was forty years behind the navies of Europe. Hence, the Mexican War is the only one of the eight wars fought by the United States from 1775 to the present in which American sea power played practically no part. Farragut made every effort to rouse the Navy Department of that day to take a leading part in capturing the Mexican stronghold San Juan de Ullóa that protected Vera Cruz, but he was overruled and felt the disappointment keenly; to him it was the loss of an opportunity to end the war quickly. This whole period lends color to the contention that a merchant marine and a navy are mutually interdependent, acting as cause and effect upon each other, the

²Wellington to Liverpool, Nov. 18, 1814, Castlereagh Letters, Series III., Vol. II, 203.

one fostering the other. An active ocean commerce furnishes the trained shipbuilders, skilled seamen, and revenues wherewith to build and man a navy. Moreover, such a merchant marine gives the people a proper reason for maintaining a navy to protect its commerce. Without such commerce, the maintenance of a big navy seems to a democratic people too much like militarism, too much like a great waste of public money. Where the two elements coexist—merchant marine and navy—they form a natural evolution, like the expansion of great cities and their concomitant metropolitan police forces. Towards the middle of the 19th century, however, the American ocean shipping had a revival, for the fast American clipper ships ran for a while close rivals of Great Britain for the trade of the world. Americans, though busy with the winning of the West, again turned their faces seaward, toward the sea route to California and the China trade, and so contributed with their merchant ships in no slight degree towards the rapid expansion of the navy at the outbreak of the Civil War.

With these elements of sea power ready at hand, it is not surprising that the sea power of the Union was able to assemble within six months of the beginning of the Civil War a naval force of two hundred and sixty-one vessels wherewith to blockade effectively the coast line of 3500 miles from Hampton Roads to the Rio Grande. This coast line with its numerous and fine harbors was on the other hand for the Confederacy, which had no merchant marine or navy, only a great handicap—only a ready means for the sea power of her enemy to strike her quickly in as many vital spots as she had harbors. The Union navy soon seized the more unprotected harbors to use as bases for military operations against the South and so converted gradually and surely the blockade into a military occupation of the whole southern coast. Moreover, the Union fleets could and did make the Mississippi a great line for northern communications, thus helping to capture the fortress Vicksburg, and split the South in two, cutting it off from the food supplies of the states bordering the Great Father of Waters on the west; for the Confederacy, whose immediate territory was early demoralized by war, had quickly become dependent on the quieter states west of the river. Moreover, as the South was agricultural, it depended almost entirely on Europe, that is, on England, for uniforms, munitions, and all military equipment, which it paid for with its cotton that brought war prices in London. So great did the demand for cotton in

England and for munitions in the South become that a blockade runner could pay for itself in one successful round trip. But as the Union blockade tightened, it surrounded the South on three sides with a ring of iron, the so-called "Anaconda policy"—constriction from all sides. As the South was by the blockade cut off from the sources of manufactured articles, so vital to war, it is remarkable that it could hold out for four years. Without the Northern Blockade the South might have protracted the struggle indefinitely.³ As it was, Lee's armies towards the last were in rags, without shoes, powder and arms, and were on half rations. Moreover the blockade had so crippled the South financially that bread was selling in Richmond at three dollars a loaf in Confederate currency. Of course in retaliation for this slow strangulation the South with its British-bought cruisers, especially the *Florida*, *Alabama*, and *Shenandoah*, inflicted great damage on Northern shipping, estimated at \$20,000,000, but such commerce warfare, while it might delay, could not stop the strangling process. In short, the blockade of the South by the sea power of the North was the most decisive single factor in the Civil War.⁴

In the long interval of peace after the Civil War the sea power of the United States steadily waned, but was revived just in time for the test required of it by the Spanish-American War. Even before the Civil War the famous American clippers in competition with British steamers were on the decline. Moreover, the Southern commerce destroyers, like the *Alabama*, and cheaper European labor had helped to throw American commerce into foreign bottoms. But in the early eighties of the last century the American people took a renewed interest in their navy, and in the "White Squadron" they formed the nucleus of a sea power independent in its origin and growth of a merchant marine. This start stimulated Americans to enter the field of steel ship construction. While the building of this new American Navy demonstrated the fact that such a navy could come into being without

³Mahan, "Sea Power in its Relations to the War of 1812," I, 148. "Cambridge Modern History," VII, 558.

⁴Mahan, "Major Operations of the Navies in the War of American Independence," 4.

See also Mahan's "Sea Power in its Relations to the War of 1812," I, 287.

the aid of the sea-going personnel and ship-building facilities afforded by the existence of a big ocean marine, still it remains true that a previously existing merchant marine would have helped greatly not only in the construction and maintenance of a naval force but would have furnished, in popular estimation at least, better reasons for spending moneys on naval armaments. Without such a commerce to foster navies and to be protected by navies, the latter seem always to popular governments as unnecessarily militaristic and imperialistic.

But while the word imperialism came into frequent use in America just before and during and after the Spanish-American War, the new sea power of the United States was used not for aggression but rather for the freeing of peoples from the aggression of older European systems. The Spanish-American War, which was brought to a quick decision by the naval battles of Manila Bay and Santiago, freed Cuba and the Philippines from a reactionary government, decadent since the days of the Armada, which now lost the last provinces of a once great empire. The sea power of America and Britain, backing up the Monroe Doctrine early in the century, had prevented Spain under the Holy Alliance from reconquering the revolted provinces of South America; and in the end of the century the sea power of America deprived Spain of the last vestiges of an autocratic empire and gained for the United States an empire founded on self-determination. After the war with Spain the United States was free to expand in the Caribbean, the gateway to Panama, and so American sea power had blazed the trail for a Panama Canal, the gateway to the Pacific and its trade. The period of isolation for the United States was over. A vast production, a growing navy and colonial expansion now pointed the way naturally for the creation of the largest element in sea power, a new and greater merchant marine.

This new and greater merchant marine was to be one of the results of the submarine menace in the World War, much the same as a century before American commerce was greatly stimulated by another great world war. And to-day as then America was to enter the struggle as a champion of neutrality and free seas. Not only were the causes in both wars maritime, but sea power—the sea power of Britain, later powerfully aided by America's—was to have “the casting vote.” Admiral Mahan in “The Influence of Sea Power upon the French Revolution and Empire,”



Courtesy New York Shipbuilding Corporation.

DESTROYERS—THE MOST DECISIVE FACTOR AGAINST THE U-BOATS.



Courtesy United States Shipping Board.

THE FIFTY WAYS OF THE HOG ISLAND SHIPBUILDING PLANT.
AN AIRPLANE VIEW.

The rapid construction of merchantmen was the most important phase of

a scholarly and exhaustive argument, comes to the conclusion that Napoleon's final defeat at Waterloo was the result of his defeat at the sea battle of Trafalgar ten years before. Trafalgar settled the control of the sea in England's favor. After that it was a war of attrition between sea power and the continent, with the ultimate result that the resources of the world carried in ships proved greater than the resources of the continent of Europe. Napoleon's Continental System was, in Mahan's opinion, his ruin. In much the same way in the recent war the sea power of Great Britain, and later of America, in spite of the very efficient and dangerous German U-boats, kept the control of the sea and sustained the Allies and their communications in the war of attrition. Even Von Ludendorf, a witness for the defense, in his recent book admits that the two million Americans, carried across on a bridge of boats, was the decisive factor in the war. But the bridge of boats represents the communications of this great army and communications are the arteries of war. If "communications dominate war," sea power in the World War even more than in earlier wars governed communications.

On the entry of the United States into the world conflict on April 6, 1917, it had two great elements of sea power: vast resources in raw and manufactured products and the largest navy in its history, a navy ranking next to Germany's. The third element, an ocean merchant marine, it had to create. Bryce in his "American Commonwealth" says that one of the characteristics of the American people is their great energy in national crises. This characteristic was demonstrated in the crisis of 1917. With their great resources, inventive skill and energy, the Americans sent across vast supplies of food and munitions, manufactured new types of weapons against the submarine like the depth bomb and the specially devised mines, with 57,000 of which their navy accomplished the gigantic task of creating the North Sea mine barrage, 250 feet deep and extending from the Orkneys to Norway, a distance of 230 miles. The American people also speeded up naval construction to such an extent that they launched 83 destroyers, aggregating 98,281 tons, in nine months. The Mare Island yard, for example, launched a destroyer, the *Ward*, in 17½ days and completed it in 70 days from the laying of the keel. They added to their navy to October 1, 1918, 2 new battle-ships, 28 submarines, 355 submarine chasers and hundreds of

vessels of every conceivable type acquired by purchase, or charter, from the great coastwise and lake commerce of the country. Moreover, their navy in man power increased from 65,777 on April 6, 1917, to 497,030 on Armistice Day—a rapid expansion that had to be brought about without the aid of a trained sea-going personnel which a previously existing ocean marine would have afforded ready made. Manned by these young men—rapidly trained at the Great Lakes Training School and other similar camps—the navy in its 321 transports carried across the Atlantic approximately half of Pershing's army and supplies and did practically the whole ($82\frac{3}{4}\%$) of the ocean conveying with its naval vessels.

But, as we have said before, the sea power of the United States lacked one vital factor, an ocean merchant marine, and this too the people of the United States through the Shipping Board and Emergency Fleet Corporation quickly created. These agencies by commandeering and unifying the shipyards of the United States speeded up construction of merchantmen. Among other achievements the Shipping Board—a corporation to-day larger than the Standard Oil Company—repaired the 103 German liners and transferred 54 of them to the Navy Department, which by means of these alone was able to transport half a million troops. Under the work of such agencies as the Shipping Board and Emergency Fleet Corporation we witnessed the paradoxical result that the greater the destruction by the submarine, the greater the merchant marine of the United States grew. Our total imports and exports amounted in 1913 to \$4,000,000,000 and in 1918 to \$9,000,000,000. We came out of the war with a vast merchant fleet, the last and greatest element in our sea power.

Without in any slightest degree detracting from the great achievements of Foch and Haig and Pershing, may we not conclude in the words of George Washington that sea power in this World War as in the earlier six wars—the Revolution, the "French War," the Tripolitan War, the War of 1812, the Civil War and the Spanish-American War—had the casting vote? Moreover, American sea power in every one of these seven wars threw in its decisive weight on the side of human liberty.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LEADERSHIP OF MEN¹

By CAPTAIN F. B. UPHAM, U. S. Navy

Motto: "Whatsoever ye would that men should do to you,
do ye even so to them."

Leadership may be said to consist in establishing and in maintaining an *esprit de corps* within the unit, be that unit a gun division, a fire-room crew, a ship, a division or a fleet of ships, or the whole navy.

If a unit be without *esprit de corps*, it lacks leadership, lacks cohesion, loses men.²

It is the mission of the appointed leader to develop this *spirit of the unit*.

The very first essential in this development is that every individual be impressed with the fact of his own membership in the unit, that each be made to feel that *he belongs*. The fact of membership cannot be too strongly impressed upon newcomers.

Ostracism is resorted to when a unit desires to expel an undesirable member. Fellowship is extended to desirable ones. The normal human being dreads ostracism even as he yearns for fellowship.

¹ This paper received honorable mention in the competition for a cash prize offered by the commander-in-chief of the Atlantic fleet for the best paper on the subject given.

² We have recently experienced a percentage of desertions well above normal. This we are perhaps too ready to ascribe to low rates of pay. When we compare the end of the month balance in the service man's pocket with that of a man of his talents on shore, we may not be so sure that the charge of low pay is wholly correct. Perhaps some desertions, or failures to re-enlist, are chargeable to other causes—perhaps some even to unintelligent leadership. Of late years we have been compiling reports as to desertions from individual ships. Similar data as to desertions from individual divisions on board ship might throw some light on the subject.

The heart of the recruit (raw, awkward, unhappy, and probably homesick) is thus fertile soil in which to plant the seed of fellowship. So anxious is he to *belong to something*, to be a member of a "gang," that he will stand any reasonable amount of hazing or other form of initiation in order that he may shun the dread ostracism and qualify for fellowship.

By the very act of enlisting, the recruit has made a definite choice of the gang, organization, body or unit with which he seeks to cast his lot. By this action of his we know not only that he is obeying the human instinct to join something, but we know also that he wants to belong to the navy. Something in the prospects, or in the life, of the navy has appealed to him. Perhaps it is the uniform. There is said to be a psychology of uniform closely related to the "gang spirit." If this be the appeal to our recruit he has been even more specific in his choice when enlisting, for he has chosen not only a uniformed gang, but that particular gang that wears the navy uniform. Whatever it be that prompted his choice, it is his leader's first duty to foster this desire for membership in the navy, to show that uniform to be a *symbol of membership*, a symbol with a depth of meaning that cannot be grasped by one who does not *belong*.

There is another symbol of membership, not so readily understood, but which is equally important and which has equal depth of meaning when it is understood. That symbol is the military salute. The salute to the flag is understood to some extent, the salute to the individual to a less extent. The reason for this limited understanding is lack of education in the first case, with an element of the "personal matter" in the second. From being a symbol of membership in the same unit the exchange of salutes between individuals became associated with salutes rendered by recognized inferiors to superiors in countries less democratic than our own. The true nature of the military salute is that of a symbol of fellow-membership in a fighting unit, the younger or less experienced, or less responsibly placed taking the initiative. By learning to make the salute in this spirit the recruit has acquired another symbol. He is taking the second step toward qualifying for coveted membership in the unit.

Thus far the leader has been utilizing the "gang spirit" that prompted enlistment. Having impressed upon the recruit's consciousness the fact that he has "arrived" as a *member*, the

leader's next step will be to make membership so attractive in its spirit and in its accomplishments, as well as in its symbols, that sacrifices are readily made in order that it may continue.

Nor is the real leader satisfied with merely holding men in his unit against possible temptation to go elsewhere, or to desert. His ultimate aim in dealing with personnel is to keep trained men in his unit. Thus the percentage of re-enlistments among his men becomes an index of his success as a leader, just as desertions are a measure of failure. We all know the pleasure with which we learn that a good man has asked to re-enlist in our ship. We are glad that a trained man is to remain in the unit; but it is his tribute to leadership in our unit that brings gratification.

There are two main lines along which to make appeal to the recruit, namely, his own mission (ambition), and the mission of the unit to which he now belongs. In recognition of his youth, and of the limits of his horizon, we admit that his own mission must at first take first place in his mind. Hence the first appeal of the wise leader will be to the individual as such. If ambition be lacking, it must be inspired by appeal to pride. If a personal mission in life seems to be lacking, the leader will indicate one.

Having engendered the ambition to realize a personal mission, the leader manages to identify accomplishment of this along with accomplishment of the mission of the unit, and again by appeal to the "gang spirit."

Another line of appeal, and one perhaps quite as strong as either of the others, is that to loyalty, for loyalty plays a real part in the "gang spirit." There are loyalty to the cause, loyalty to the leader, and loyalty to subordinates. These are closely related, so closely in fact that there is danger of stressing the first and second at the expense of the third. Loyalty to the cause involves loyalty to the unit and to the leader. These are the goal of the leader. With them he can accomplish much. Without them he can accomplish little—or nothing. He attains them by unfailing loyalty to his subordinates. The leader jealous of the welfare and progress of his men will be ever on guard to defend their interests, to plead their cause—to interpose with request for suspended sentence, as at mast, assuming responsibility for reform on the part of offenders who are not wholly lost. This attitude on the part of the leader is returned in full by his man. To the extent

that he makes their cause his, they in turn make his cause theirs. His loyalty to them is amply reflected in loyalty to himself and to the mission of his unit. Offenders experiencing his defense of them, in so far as their cause is just, seek to remain within the law, to improve, to reform and to *perform*, in gratitude for his interest. Offenders become fewer. The tone of the unit is raised.

Particularly is loyalty to petty officers essential, that they may feel the support of their leader, and that they may seek further to merit it. It requires no small degree of discernment to render correct judgment as between some petty officers and their delinquent men. Only the study and knowledge of men, together with experience, can equip one with expert judgment; but each experience will be of benefit for the future. A petty officer possessed of leadership will not present difficulties of this nature; but one who is repeatedly complaining of his men, or calling for their punishment, would better be disrated as lacking leadership. However much of a seaman he may be, whatever of mechanical skill he may possess, he cannot be retained in a leader's billet without detriment to the spirit of the unit.

Before quitting the subject of loyalty let it be remarked, and not by any means in parenthesis, that loyalty to the mission of the smaller unit (division) must never be permitted to obscure the larger unit (ship) and its mission. The division's mission is not performed if it does not contribute wholly to the ship.

Much depends upon first impressions. The recruit making his first acquaintance with the service should receive the very best leadership available. A good officer will make the first impressions good ones. No leader can make good impressions unless he show in himself "a good example of virtue, honor, patriotism and subordination." This good impression may be greatly enhanced by a leader who, in his relations with subordinates, shows himself to be a capable mariner. He should be that of course, but also a great deal more. He should be as well a gentleman of liberal education, refined manners, punctilious courtesy, and the nicest sense of personal honor.

Ever is the leader under most searching scrutiny on the part of subordinates. He is under constant examination as to the degree of his knowledge, of his ability, of his skill in every branch of his profession, and in particular as to his ability in handling men under his tuition—his consideration for their welfare and

progress, his firmness in exacting correct performance of individual tasks.

Without wishing to detract in the least from the importance of ability and skill in other branches of our profession (excellence in them is of great assistance to the leader), the greater importance of leadership of men is urged. If leadership be among his own talents a leader will, by that fact, discover talents and skill among his subordinates, including leadership; and these will be at his command in accomplishing the mission of his unit.

In the administration of his unit the leader will find that "honesty is the best policy." Men will not follow one whom they cannot trust. The would-be leader who is tricky does not accomplish results. He may meet with minor successes, but in the end his false steps bring him to one that is fatal to ultimate success. None are quicker to realize a lack of honesty than are subordinates.

A failure on the part of the leader to be open and above-board with superiors, say, is known to them. At once they question his good faith with themselves. To them his failure is a demonstration of bad faith. They lose faith in him. They may not put the thought into words, or even be conscious of the thought itself, but their reaction is loss of faith in the leader.

More than that, his bad example will beget trickiness and deception among the less discriminating of his men. Carelessness that they might conceal during drill may result in loss of life to a shipmate.

Likewise, exact justice to all should be practised as cultivating faith in and acceptance of the leader's judgment. No punishment should be awarded that savors in the least of personal feeling. The offender must be shown that punishment follows offense as night follows the day—not as depending upon the whim of the leader, but in accordance with a schedule prescribed and applied to all alike, and known to all. A self-respecting man, knowing the penalty for his act, will take his medicine. No guilty man expects to escape. The duty of the leader is to see to it that the punishment is just, that it meets the offense, and that it safeguards the spirit of the unit.

The faith of the leader in his men makes strong appeal. Let any man know your estimate of him and he will strive to meet it. If your estimate be high, so will be his aim. No good man will wish to fall short, and a liberal estimate indicated to a mediocre,

or backward, man will almost always lift that man above his own estimate. It will stimulate his pride. Gaining pride in himself, there will follow pride in the unit. Unit pride indicates leadership.

Since no two men are more alike in temperament than in personal appearance, the leader must exercise a degree of tact that shall foster and preserve individuality and self-respect while at the same time imposing upon each member the imprint of the unit. This calls for patience in leading backward ones over rough spots.

Encouragement, commendation for even slight improvement, will go far toward success, while reproof and too hastily administered punishment are disheartening to beginners and should be withheld as long as there is hope of accomplishment otherwise. Words of encouragement should be spoken openly and even in the hearing of others—

No meritorious act of a subordinate should escape attention or be left to pass without its reward, if even the reward be only one word of approval.

Many are the opportunities for rewarding the deserving. There are desirable billets to be filled, excursions to be made, chances for advancement along special lines, promotions to be made.

Reproof should be reserved for privacy. Men should be encouraged to keep their records clear. The leader will avoid as long as possible that repository of unsolved problems—the Report Book.

Honesty, justice, faith, are all of them attributes valuable to the leader as to persons otherwise engaged in life, but it may be said that the leader with these alone is not fully equipped—to them must be added tact.

The leader is neither a gang boss nor a driver. He is dealing with a higher order of humanity than requires either bossing or driving. Indeed, the order of intelligence of the subordinates with whom he is dealing is such that he himself must *qualify*. Practicing the other attributes, he has not yet qualified until he shall practice also tact.

The observance of rules is ever irksome to youth, but only because the individual youth is as yet raw material, crude and uninformed. His earlier breakings of the rules are largely due to ignorance or the lack of proper instruction. An ignorant person is to be pardoned and instructed. The leader will discriminate

as between the ignorant offender and the deliberate one. This is an early and a most important step in handling men.

Every recruit, however raw, is possessed of a certain degree of intelligence, and seldom is one so lacking as not to understand an earnest leader. Every recruit is open to instruction and, whether wittingly or not, is seeking knowledge. It is his right that he be given it with helpful tact.

It is to the leader that he comes in search of knowledge of how to handle himself, and of how to qualify for a place on the team. If the rules be handed out to him with a club his resentment is aroused. He is mortified, offended, repulsed. Whereas he had approached the situation in a receptive mood, he has by this gross act of a deficient leader shut himself up against both leader and rules. His reaction is best expressed by the words "To hell with him and rules."

Withal there is the leader's obligation to be firm, requiring instant response and correct performance. The imperative necessity for these on the part of subordinates is well set forth in a letter in the files of the War Department, as follows:

Safety demands the habit of instant obedience.

In the emergency of battle, when every condition tends to distract men's attention, and peril is on every side, safety for a command frequently lies only in its organized and co-ordinated activity; and this can proceed from one inspiration alone—the instant and unquestioning compliance by all with the voice of authority.

This habit cannot be created in emergency and forgotten under other circumstances, but must result from practice which tolerates no exceptions either of persons or occasions.

The relationship between officers and men, therefore, must be so arranged as to lead to this indispensable result; but this is entirely consistent with respect, sympathy and mutual consideration, and the best officers are those who have completely won the affection of their men.

Even if there were not this overshadowing obligation ever to be in training against the hour of battle, in the navy we have with us at all hours of the day and night the responsibility for the lives of our shipmates. A boat not properly hooked on, a hatchway not guarded, a life buoy not honestly tested and rigged, an ammunition car operated on a wrong signal—each of these has cost a life or a limb in the service, not once, but many times.

One of our most successful young officers kept a "personnel log" (card index) of his men. For each man there was a separate card upon which were entered the usual official data as to

name, rate, etc. To this were added matters of more personal nature, such as the amount and beneficiary of his allotment, condition of beneficiary, the amount of schooling the man had had, what sports most interested him, or those in which he had some skill, notes of his home town, other items of interest to the man that might develop during the course of a semi-confidential conference while the card was being made out.

Needless to relate that in learning all this, and in letting the newcomer see it being recorded, the officer at once established a personal relationship with the man, and so with every man in the division. This interest in them prompted desire on their part to make good in his eyes. They strove for his commendation. Few of them became acquainted with the mast. Knowing of the entries on his personal card, a man in trouble went naturally to his division officer for counsel and advice, feeling that his problems would be met with helpful sympathy—and those problems included, as often as not, matters of welfare at home.

Is there room for doubt as to the leadership of that officer? Is there surprise that he was successful? Consider the attitude of his men when tackling a job put up to the division, each man putting forth his greatest strength, his greatest skill, his keenest wit, toward putting over the division's job—each actuated by the spirit of the unit!

Practicing true leadership, this officer fostered leadership among his men. His petty officers were charged with responsibility, each to the limit of his capabilities. The personnel of the division was divided into squads with a petty officer leader of each, charged with the supervision of the clothing and bedding outfits of his men, and required to take active part in their instruction and work. Competition among squads raised the general standing of the division.

In the same ship, as it so happened, the chaplain had card indexed the men with reference to their home ports and towns, with entries as to name and address of next of kin. Upon arrival of the ship in any port included in the index the chaplain's duty was to visit all the homes of men in or near that port. (The welfare fund was drawn upon to meet expenses of his transportation, and the money was well spent.) The chaplain carried with him to each home a message of courtesy from the captain of the ship. The welcome received at every home was such as

to confirm a personal relationship that lasted long after any man concerned had been transferred or discharged. The whole navy was done lasting good by those visits.

The chaplain was called in to baptise the little ones at home, to marry the sailor lad to the girl of his choice, or to perform the sad rites of laying away those who had passed on. Our division officer—he of the personnel log—was quick to see in the chaplain's activities a means of gaining closer hold on his men.

Interest thus shown in the home folks was reflected in interest by them in the progress of their son in the ship and in the navy. If the lad's interest faltered those at home enlisted themselves on the side of the ship and of the division officer, to the end that overtime and desertions grew fewer in number. With this reduction in offenses of this nature there resulted a smaller "turn over of labor"—fewer vacancies called for fewer recruits, fewer recruits meant a greater percentage of trained men on hand for battle practice.

As a conspicuous example of the spirit of the unit in a whole ship's company it is a pleasure to refer to one of our dreadnoughts in which every division had in its compartment a Christmas tree. When the ship was in a home port for the holiday season needy children were brought on board for Christmas dinner, after which each was presented with a suitable toy and an outfit of warm winter clothing. When in a foreign port during the war the same custom was observed, the children being collected from that port.

There was here the additional virtue of personal sacrifice on the part of all hands, for the number of children served and the excellent quality of the gifts were such as to involve no small subscriptions. Personal sacrifice is of the essence of life in the service; wherefore the benefit to be derived from this self-denial.

Here was a spirit of the unit. Here was leadership.

With the signs, and the spirit, and the worthy example, practiced by the leader and by his men, the unit attains to usefulness. Individuals observe the rules because of their appeal to the spirit. Finding their own interests alive in the mind of the leader, men's minds are to no small extent relieved of anxieties, real or fancied, and are to that extent the more free to concentrate on the mission of the unit. They become *for* the unit. They have found places in it. They lend a hand. They are members of the team. Their own success and that of the unit merge.

In a paper on leadership of men it is pertinent to quote from the pen of one whose leadership stands out with a record of achievement. In this paper short quotations have been made from John Paul Jones' letter of 14 September, 1775, to the Naval Committee of Congress. That letter gives so complete and so concise a statement of the requirements of a leader that additional quotations are here ventured.

Writing of the desired attributes of an officer of the navy, the illustrious sea-fighter says:

He should not be blind to a single fault in any subordinate, though at the same time he should be quick and unfailing to distinguish error from malice, thoughtlessness from incompetence, and well-meant shortcoming from blunder. As he should be universal and impartial in his rewards and approval of merit, so should he be judicial and unbending in his punishment or reproof of misconduct.

Again:

He should ever maintain the attitude of the commander [leader]; but that need by no means prevent him from the amenities of good cheer within proper limits.

Still again:

In his relation to those under his command, he should be the soul of tact, patience, justice, firmness and charity.

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SLIDE RULES FOR NAVIGATORS

By CAPTAIN ARMISTEAD RUST, U. S. Navy

In a paper entitled "General Solutions of the Problems of 'The Reduction to the Prime Vertical and to the Meridian,' with a New Graphic Method for the Solution of Various Problems in Navigation," which appeared in the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, Whole No. 151, May-June, 1914, the writer indicated how certain problems in nautical astronomy might be solved with slide rules.

These slide rules are shown on Plate II which accompanies this paper and with them all of the ordinary problems of astronomical navigation may be solved, including the "Time Sight" and the "Marcq Saint-Hilaire Method."

ABBREVIATIONS AND SYMBOLS

A = point of departure in *G. C.* sailing; B = destination.

C = course; C_1, C_2 = initial and final courses in great circle sailing.

d = declination of observed body.

$D = AB = G. C. D.$ = great circle distance from A to B .

$D_A = G. C. D.$ from A to vertex V ; $D_B = G. C. D.$ from B to vertex V .

Δh = difference between true altitude off the meridian and meridian altitude, or the "Reduction to the Meridian."

h = true altitude of center of observed body.

h_0 = meridian altitude of observed body.

h_v = altitude on the prime vertical.

L = latitude of ship or observer.

L_1 = latitude of departure in *G. C.* sailing.

L_2 = latitude of ship destination in *G. C.* sailing.

L_v = latitude of vertex in *G. C.* sailing.

$G. A. T., G. M. T., G. S. T.$ = Greenwich apparent, mean and sidereal times.

$L. A. T., L. M. T., L. S. T.$ = local apparent, mean and sidereal times.

$M. Z. D.$ = meridian zenith distance of observed body $= z_0 = 90^\circ - h_0$.

p = polar distance of observed body $= 90^\circ \mp d$.

$P. V.$ = prime vertical.

$R. A.$ = right ascension; $R. A. M. S.$ = right ascension of mean sun.

t = local hour angle of observed body $= H. A.$

t_v = hour angle on prime vertical.

V = vertex of great circle track.

z = zenith distance of observed body $= 90^\circ - h$.

z_0 = meridian zenith distance $= L \mp d = 90^\circ - h_0$.

Z = true azimuth of observed body.

λ = difference of longitude between A and B in $G. C.$ sailing.

λ_A = difference of longitude between A and vertex V .

λ_B = difference of longitude between B and vertex V .

λ_1 = longitude of point of departure A in $G. C.$ sailing.

λ_2 = longitude of point of destination B in $G. C.$ sailing.

α (alpha), β (beta), Δ (delta), λ (lambda), θ (theta) = Greek letters to indicate auxiliary angles.

$a > b$ means a is greater than b ; $c < d$ means c is less than d .

$L \sim d$ means $L - d$ or $d - L$ according to whether $L > d$ or $d > L$.

In the formulas used in explaining the use of the slide rules, which are given in the various problems, the letter in parentheses which follow any quantity indicates the scale on which that quantity is to be used.

RULES I AND V

These are the same, except Rule V has been made to a much larger scale and therefore its range is limited.

PROBLEM I.—Find the azimuth of a celestial body, given its hour-angle, declination and true altitude.

$$\sin t (A) \cos d (B) = \cos h (C) \sin Z (D). \quad (1)$$

Set d on scale B to t on scale A , then opposite h on scale C find the azimuth Z on scale D .

NAMING THE AZIMUTH

1. Mark the azimuth E. or W. according to whether the observed body is east or west of the meridian of the observer.

2. When $L = 0^\circ$ give the azimuth the same name as the declination.

3. When the latitude and the declination are of the same name and the latitude is less than the declination; the azimuth has the same name.

4. When the latitude and the declination are of contrary names, the azimuth has the name of the declination.

5. When the latitude and the declination have the same name, and the declination is less than the latitude, the body will cross the prime vertical. When it is between the P. V. and the elevated pole, that is, when its hour-angle is greater than the hour-angle on the P. V., the azimuth will have the same name as the latitude. When the body is between the P. V. and the equator, that is, when its hour-angle is less than t_v , the hour-angle on the P. V., the azimuth will have the contrary name to the latitude.

The hour-angle on the P. V. may be found with Rule II as shown below.

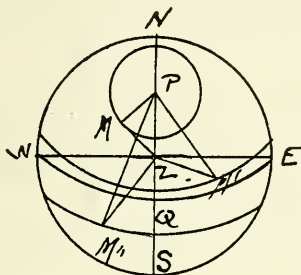


FIG. 1.

The reasons for the above rules will be seen from an examination of Fig. 1, which shows the celestial sphere projected on the plane of the horizon. M, M', M'' are the positions of three bodies.

By naming the azimuths in this way we avoid the use of angles greater than 90° .

Example 1.— $L=0^\circ$; $t=4^h 30^m$ (west); $d=28^\circ$ N.; $h=20^\circ$.
Find Z. *Ans.* N. $60^\circ 12'$ W.

Example 2.— $L=19^\circ$ N.; $t=4^h 18^m$ (east); $d=29^\circ$ N.; $h=31^\circ$.
Find Z. *Ans.* N. $67^\circ 4'$ E

Example 3.— $L=25^\circ$ S.; $t=3^h 20^m$ (east); $d=28^\circ$ N.; $h=19^\circ$.
Find Z. *Ans.* N. $45^\circ 38'$ E.

Example 4.— $L=48^\circ$ N.; $t=5^h 55^m$ (west); $d=28^\circ$ N.; $h=21^\circ$.
Find Z. *Ans.* N. 71° W.

Here $t_v=4^h 6^m$ and as $t > t_v$, Z has the same name as L.

Example 5.— $L=45^\circ$ S.; $t=3^h 10^m$ (east); $d=26^\circ$ S.; $h=48^\circ$.
Find Z. *Ans.* N. 83° E.

Here $t_v=4^h 3^m$ and, as $t < t_v$, Z has the contrary name.

PROBLEM 2.—Given the latitudes of the points of departure and destination L_1 and L_2 , the G. C. D. between them D , and their difference of longitude λ , find the initial and final G. C. courses C_1 and C_2 .

$$\sin \lambda(A) \cos L_2(B) = \cos(90^\circ \sim D)(C) \sin C_1(D). \quad (2)$$

Set L_2 on scale B to λ or $(180^\circ - \lambda)$ on scale A ; then opposite $(90^\circ \sim D)$ on scale C , find C_1 on scale D . To find C_2 proceed as above, using L_1 in place of L_2 .

NAMING THE COURSES

The vertex V of the G. C. track AB is the foot of a perpendicular let fall from the pole P on AB or AB produced, and is the

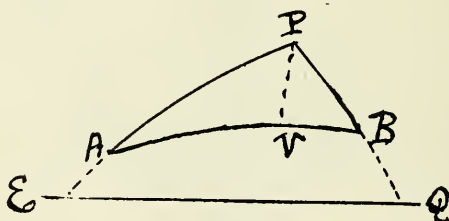


FIG. 2.

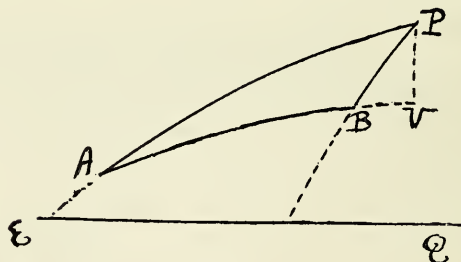


FIG. 3.

point of highest latitude. When V falls between A and B , C_1 and C_2 are each less than 90° (Fig. 2); when V falls beyond A or B , or on AB produced, as in Fig. 3, and $L_2 > L_1$, then $C_1 < 90^\circ$ and $C_2 > 90^\circ$, when reckoned from the elevated pole P ; or in this case C_2 read from scale D is given the contrary name to the latitude, or its supplement is given the same name. In all cases mark the course E. or W. according to the direction in which the ship is going.

NOTE.—In order to determine, when in doubt, whether V falls within or without the triangle APB , find C_1 and C_2 with Rule IV. When both are less than 90° , reckoned from the same pole, V is "in"; when one is greater and the other less than 90° , V is "out," and nearer the point of greater latitude.

Example 6.—Find the initial and final courses from A , $L_1 = 35^\circ$ N., to B , $L_2 = 36^\circ$ N., the difference of longitude $\lambda = 70^\circ 30'$, and $D = 3360$ miles; B being east of A . Here $90^\circ - D = 34^\circ$ and V is "in." *Ans.* $C_1 = \text{N. } 66^\circ 50' \text{ E.}$; $C_2 = \text{S. } 68^\circ 40' \text{ E.}$

Example 7.—Find C_1 and C_2 from A in $L_1 = 33^\circ$ S., Long. $151^\circ 50' \text{ E.}$, to B in $L_2 = 9^\circ$ N., Long. $79^\circ 30' \text{ W.}$; $D = 7620$ miles $= 127^\circ$. As $\lambda = 128^\circ 40'$, use $180^\circ - \lambda = 51^\circ 20'$ on scale A , and $D - 90^\circ = 37^\circ$ on scale C . V is "in."

Ans. $C_1 = \text{S. } 75^\circ 15' \text{ E.}$; $C_2 = \text{N. } 55^\circ 5' \text{ E.}$

PROBLEM 3.—Given the latitudes and longitudes of the points of departure and destination, and the initial or final course, find the G. C. D. between them. See formula (2).

Set L_2 on scale B to λ or $(180^\circ - \lambda)$ on scale A , and find $(90^\circ \sim D)$ on scale C opposite C_1 on scale D .

Example 8.—Find D from A in $L_1 = 35^\circ 30' \text{ N.}$, Long. $140^\circ 52' \text{ E.}$, to B in $L_2 = 33^\circ \text{ S.}$, Long. $71^\circ 49' \text{ W.}$, given $C_1 = \text{N. } 94^\circ 18' \text{ E.}$ *Ans.* $D = 9180$ miles.

When C and λ are greater than 90° use their supplements.

Any formula deduced by Napier's Second Rule may be solved with Rule I or V.

PROBLEM 4.—Given the latitude of departure or destination and the initial or final course, find the latitude of the vertex.

$$\sin C_1(A) \cos L_1(B) = \cos L_v(C) \sin 90^\circ(D), \quad (3)$$

$$\sin C_2(A) \cos L_2(B) = \cos L_v(C) \sin 90^\circ(D). \quad (4)$$

Set L_1 on scale B to C_1 on scale A and find L_v on scale C opposite 90° on scale D .

Example 9.—Given $L_1 = 35^\circ \text{ N.}$, and $C_1 = \text{N. } 66^\circ 50' \text{ E.}$ Find L_v . *Ans.* $L_v = 41^\circ 10' \text{ N.}$

Example 10.—Given $L_1 = 37^\circ 50' \text{ S.}$, $C_1 = \text{S. } 47^\circ \text{ E.}$ Find L_v .

Ans. $L_v = 54^\circ 42' \text{ S.}$

PROBLEM 5.—Given the latitudes of the points of departure and destination and the latitude of the vertex, find the distances from these points to the vertex and the total distance.

$$\sin 90^\circ(A) \cos(90^\circ - L_1)(B) = \cos D_A(C) \sin L_v(D). \quad (5)$$

Set $(90^\circ - L_1)$ on scale B to 90° on scale A and find D_A on scale C opposite L_v on scale D . Find D_B by using L_2 in place of L_1 in (5).

Example 11.— $L_1 = 35^\circ$ N., $L_2 = 36^\circ$ N. and $L_v = 41^\circ 10'$ N. Find D_A , D_B and D .

Ans. $D_A = 29^\circ 30'$, $D_B = 26^\circ 50'$ and $D = 3380$ miles.

PROBLEM 6.—Given the hour-angle of a body on the prime vertical, its declination and the latitude of the observer, find its altitude on the prime vertical.

$$\sin t_v(A) \cos d(B) = \cos h_v(C) \sin 90^\circ(D). \quad (6)$$

Set d on scale B to t_v on scale A and find h_v on scale C opposite 90° on scale D .

Example 12.— $L = 50^\circ$ N.; $d = 28^\circ$ N., and $t_v = 4^h 14^m$. Find h_v .

Ans. $37^\circ 47'$.

NOTE ON RULES I AND V.—Scale A should have been laid off in hours and minutes. Due to oversight the scale of degrees was inserted and it was necessary to place the scale of hours and minutes above this, as no time was available to make new drawings. As Rules I and V now stand scales C and D are not necessary, but they are useful in that they simplify the instructions for using the Rules.

RULE II

Any formula deduced by Napier's First Rule may be solved with Rule II, thus in all cases problems involving right spherical triangles may be solved with either Rule I or Rule II.

PROBLEM 7.—Find the hour-angle of a celestial body when on the prime vertical, given its declination and the latitude of the observer.

$$\tan d(E) \cot L(F) = \cos t_v(G) \times 1(H). \quad (7)$$

Set L on scale F to d on scale E and find t_v on scale G opposite the mark X on scale H .

Example 13.— $L = 50^\circ$ N.; $d = 28^\circ$ N. Find t_v .

Ans. $4^h 14^m$.

PROBLEM 8.—Given the latitudes of departure and destination, and the latitude of the vertex, find the longitudes of the vertex from the points of departure and destination.

$$\tan L_1(E) \cot L_v(F) = \cos \lambda_A(G) \times 1(H), \quad (8)$$

$$\tan L_2(E) \cot L_v(F) = \cos \lambda_B(G) \times 1(H). \quad (9)$$

Set L_v on scale F to L_1 on scale E and find λ_A on scale G opposite X on scale H .

Example 14.— $L_1=35^\circ$ N.; $L_2=36^\circ$ N. and $L_v=41^\circ 10'$ N. Find λ_A and λ_B . *Ans.* $\lambda_A=36^\circ 45'$; $\lambda_B=33^\circ 45'$.

PROBLEM 9.—Given the latitude of the vertex and the longitudes from the vertex to the points of departure and destination, find the distances from the vertex to these points and the total distance along the G. C. track.

$$\tan D_A(E) \cot \lambda_A(F) = \cos L_v(G) \times 1(H). \quad (10)$$

Set L_v on scale G to the mark X on scale H and find D_A on scale E opposite λ_A on scale F . Find D_B by using λ_B for λ_A .

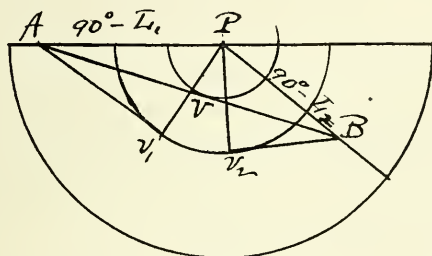


FIG. 4.

Example 15.— $L_v=41^\circ 10'$ N.; $\lambda_A=36^\circ 45'$; $\lambda_B=33^\circ 45'$. Find D_A , D_B and D .

Ans. $D_A=29^\circ 23'$; $D_B=26^\circ 45'$; $D=3368$ miles.

PROBLEM 10.—Composite sailing.

Example 16.—Find the distance along the composite track from A in $L_1=23^\circ$ S., Long. 43° W., to B in $L_2=34^\circ$ S., Long. 115° E., with the limiting parallel 55° S. Find also the initial and final courses along this track.

Fig. 4 shows the track projected on the plane of the equator.

(a) Find the distances $Av_1=D_A$ and $Bv_2=D_B$.

$$\sin L_{v_1}(A) \cos D_A(B) = \cos(90^\circ - L_1)(C) \sin 90^\circ(D). \quad (11)$$

Set $(90^\circ - L_1)$ on scale C to 90° on scale D and find D_A on scale B opposite L_{v_1} on scale A . Find D_B by using L_2 in place of L_1 in (11). We find $D_A=61^\circ 32'$ and $D_B=46^\circ 57'$.

(b) Find the differences of longitude $APv_1=\lambda_A$ and $BPv_2=\lambda_B$. We have

$$\tan L_1(E) \cot L_{v_1}(F) = \cos \lambda_A(G) \times 1(H). \quad (12)$$

Set L_{v_1} on scale F to L_1 on scale E and find λ_A on scale G opposite X on scale H . Thus, $\lambda_A = 72^\circ 45'$ and $\lambda_B = 61^\circ 50'$. $\lambda_A + \lambda_B = 134^\circ 35'$, and $APB = 158^\circ$. Hence, $v_1 P v_2 = 23^\circ 25' = 1405'$. From Traverse Tables we find departure parallel $55^\circ = 800$ miles, hence total distance $D_A + D_B + 800 = 7309$ miles. The G. C. D. from A to $B = 7153$ miles and the distance lost is 152 miles.

(c) Find the courses from A to v_1 and from B to v_2 .

$$\sin PA v_1(A) \cos L_1(B) = \cos L_{v_1}(C) \sin 90^\circ(D). \quad (13)$$

Here $L_{v_1} = L_{v_2} = 55^\circ$. Set L_{v_1} on scale C to 90° on scale D and find $PA v_1$ on scale A opposite L_1 on scale B . We thus find $PA v_1 = S. 38^\circ 27' E.$ and $PB v_2 = S. 43^\circ 40' W.$

PROBLEM 11.—To lay down a great circle track on a Mercator chart.

1. Find the initial and final courses with Rule IV, Problem 15.
2. These determine whether the vertex is "in" or "out."
3. Find the latitude of the vertex with Rules I or V, Problem 4.
4. Find the longitudes of the vertex from A and B , λ_A and λ_B , Rule II.
5. Plot the position of the vertex if "in."
6. Determine a sufficient number of points in the track with Rule II and draw a curve through them with a flexible batten or connect them by straight lines.

Points may be determined in the track by assuming latitudes ranging between those of departure and destination and that of the vertex, and finding the corresponding longitudes. Thus, if L_p be the latitude of any point in the G. C. track and λ_p be its corresponding longitude from the vertex, then for each value of L_p two points in the track are determined by $\pm \lambda_p$, as each parallel of latitude intersects the G. C. track in points whose longitudes from the vertex are equal. From (8), we have

$$\tan L_p(E) \cot L_v(F) = \cos \lambda_p(G) \times 1(H).$$

Set L_v on scale F to the assumed latitudes, taken in succession, on scale E and find the corresponding longitudes on scale G opposite the mark X on scale H .

If preferred the longitudes may be assumed and the corresponding latitudes found thus:

Set the longitudes in succession on scale G to the mark X on scale H , and find the corresponding latitudes on scale E , opposite L_v on scale F .

In order to shape a G. C. C. from time to time during a voyage, note that if the initial G. C. D. be known, or is computed, it will not be necessary to recompute it during the voyage, as a rule, as the distance to the destination may be found every time it is desired to change the course by deducting the total distance made good from the initial distance and thus obtain the data for using Rules I or V for obtaining a new G. C. C. as often as may be desired.

RULE III

PROBLEM 12.—Given the rate of change of altitude per minute R_m of a celestial body and the latitude of the observer, find the azimuth of the body.

$$15 \sin Z(J) \cos L(K) = 1(L) \times R_m(M). \quad (14)$$

Set 1 on scale L to R_m on scale M and find Z on scale J opposite the latitude L on scale K .

Example 17.—At sea $L = 12^\circ$ N. From the difference between two observed altitudes of an unknown star and the interval between the sights its rate of change of altitude per minute was $13.3'$. The star being in the S. E. quadrant, what was the true bearing of the star?

Ans. S. 64° 45' E.

THE REDUCTION TO THE MERIDIAN BY THE MEAN AZIMUTH METHOD

This method was fully demonstrated by the writer in the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, Whole No. 151, May-June, 1914.

PROBLEM 13.—Given the latitude by D. R., the true altitude, hour-angle and bearing or azimuth of a known celestial body, find the "reduction Δh " of this altitude to the meridian altitude and thence the latitude of the observer.

$$15 \sin \frac{1}{2}Z(J) \cos L(K) = t(L) \times \Delta h(M). \quad (15)$$

Set the latitude by D. R., L , to $\frac{1}{2}Z$ on scale J and find the reduction to the meridian Δh in minutes of arc, on scale M opposite t , expressed in minutes and decimals of time on scale L .

NOTE.—If $\frac{1}{2}Z$ is less than $3^\circ 49'$, use Z on scale J and divide the number found on scale M by 2 to obtain Δh .

When $t > 10$, use $\frac{t}{n}$ on scale L , where n is any convenient factor, usually 10, and multiply the quantity found on scale M by n .

Example 18.— $L=34^{\circ} 15' \text{ N.}$; $d=0^{\circ}$; $t=40$ minutes; $h=54^{\circ} 43' 36''$. Find $\frac{1}{2}Z$, Δh and the correct latitude.

Ans. $\frac{1}{2}Z=8^{\circ} 52'$; $\Delta h=1^{\circ} 16.6'$; $L=33^{\circ} 59.8' \text{ N.}$

NOTE.—When the hour-angle is less than 60 minutes the bearing of the body is very nearly directly proportional to the hour-angle. Therefore in such a case find the azimuth Z' for one hour with Rule I, and if n be the number of minutes in the given hour-angle, the required azimuth $Z=\frac{n}{60} \times Z'$. In this way obtain $\frac{1}{2}Z=8^{\circ} 52'$ in the above example.

When $t < 60$ min. the azimuth may also be found by Plate I.

Example 19.— $L=36^{\circ} 15' \text{ N.}$ by D. R.; $d=17^{\circ} \text{ S.}$; $t=60$ min.; $h=34^{\circ} 39'$. Find $\frac{1}{2}Z$, Δh and the correct latitude.

Ans. $\frac{1}{2}Z=8^{\circ} 45'$; $\Delta h=110.3'$; $L=36^{\circ} 30.7' \text{ N.}$

Example 20.—In $L=38^{\circ} 15' \text{ N.}$ by D. R. The true altitude of λ Draconis, near the lower transit, was $18^{\circ} 50' 42''$, star's hour-angle=60 minutes and declination $69^{\circ} 47'$. Find Z , Δh and the latitude.

Ans. $Z=5^{\circ} 30'$; $\Delta h=33.7'$; $L=38^{\circ} 30' \text{ N.}$

NOTE.—Here Z does not fall within the limits of Rule I, but it may be found from Plate I or the formula $\sin Z = \sin t \cos d \sec h$.

RULE IV

PROBLEM 14.—The time-azimuth. Given the latitude of the observer and the hour-angle and declination of a celestial body, to find its azimuth.

$$\cot \frac{1}{2}t \cos \frac{1}{2}(L \sim d) = \cos \{90^{\circ} - \frac{1}{2}(L + d)\} \tan \frac{1}{2}(Z + M), \quad (16)$$

$$\cot \frac{1}{2}t \cos \{90^{\circ} - \frac{1}{2}(L \sim d)\} = \cos \frac{1}{2}(L + d) \tan \frac{1}{2}(Z \sim M). \quad (17)$$

(1) Set $\frac{1}{2}(L \sim d)$ on scale P to $\frac{1}{2}t$ on scale N and find the angle X on scale R opposite $90^{\circ} - \frac{1}{2}(L + d)$ on scale Q .

(2) Set $90^{\circ} - \frac{1}{2}(L \sim d)$ on scale P to $\frac{1}{2}t$ on scale N and find the angle Y on scale R opposite $\frac{1}{2}(L + d)$ on scale Q .

(3) When $L > d$: $Z = X + Y$. When $L < d$: $Z = X \sim Y$; L and d being of the same name.

(4) Give the azimuth the same name as the latitude of the observer and mark it E. or W. according to whether the body is east or west of his meridian.

(5) Mark the latitude of the observer $+$, and the declination when of the same name $+$, when of contrary name $-$.

(6) In (1) when $d > L$ and of the contrary name, use $90^{\circ} - \frac{1}{2}(d - L)$ on scale Q , and X is the supplement of the angle X' found on scale R .

(7) When L and d are of contrary names $Z = X + Y$ in all cases.

(8) When L and d are of contrary names ($L \sim d$) and ($L + d$) in (1) and (2), become ($L + d$) and ($L \sim d$), respectively.

Example 21.— $L = 38^\circ$ N.; $d = 16^\circ$ N.; $t = 3^h 40^m$ (west). Find Z .

$$\begin{array}{ll} \text{(a)} & \frac{1}{2}t = 1^h 50^m \\ X \text{ (b)} & \frac{1}{2}(L - d) = 11^\circ \\ \text{(c)} & 90^\circ - \frac{1}{2}(L + d) = 63^\circ \\ & X = 76^\circ 25' \end{array} \quad \begin{array}{ll} \text{(a)} & \frac{1}{2}t = 1^h 50^m \\ Y \text{ (d)} & 90^\circ - \frac{1}{2}(L - d) = 79^\circ \\ \text{(e)} & \frac{1}{2}(L + d) = 27^\circ \\ & Y = 22^\circ 30' \end{array}$$

As $L > d$, $Z = X + Y = 98^\circ 55'$.

Ans. $Z = \text{N. } 98^\circ 55' \text{ W.}$

Note that in the groups for finding X and Y , (a) is the same in both, and (d) and (e) are the complements of (b) and (c) respectively.

Example 22.— $L = 39^\circ$ S.; $d = 17^\circ$ N.; $t = 4^h 20^m$ (east). Find Z .

Ans. $Z = \text{S. } 119^\circ 7' \text{ E.}$

$$\begin{array}{ll} \text{(a)} & \frac{1}{2}t = 2^h 10^m \\ X \text{ (b)} & \frac{1}{2}(L + d) = 28^\circ \\ \text{(c)} & 90^\circ - \frac{1}{2}(L - d) = 79^\circ \\ & X = 82^\circ 7' \end{array} \quad \begin{array}{ll} \text{(a)} & \frac{1}{2}t = 2^h 10^m \\ Y \text{ (d)} & 90^\circ - \frac{1}{2}(L + d) = 62^\circ \\ \text{(e)} & \frac{1}{2}(L - d) = 11^\circ \\ & Y = 37^\circ \end{array}$$

$$Z = X + Y = 119^\circ 7'.$$

Example 23.— $L = 10^\circ$ N.; $d = 22^\circ$ S.; $t = 4^h 30^m$ (west). Find Z .

Ans. $Z = \text{N. } 116^\circ 43' \text{ W.}$

$$\begin{array}{ll} \text{(a)} & \frac{1}{2}t = 2^h 15^m \\ X' \text{ (b)} & \frac{1}{2}(L + d) = 16^\circ \\ \text{(c)} & 90^\circ - \frac{1}{2}(d - L) = 84^\circ \\ X' = 85^\circ 52'; & X = 180^\circ - X' = 94^\circ 8' \end{array} \quad \begin{array}{ll} \text{(a)} & \frac{1}{2}t = 2^h 15^m \\ Y \text{ (d)} & 90^\circ - \frac{1}{2}(L + d) = 74^\circ \\ \text{(e)} & \frac{1}{2}(d - L) = 6^\circ \\ & Y = 22^\circ 35' \end{array}$$

$$Z = X + Y = 116^\circ 43'.$$

GREAT CIRCLE COURSES AND DISTANCES

PROBLEM 15.—Given the latitudes and longitudes of the points of departure and destination to find the initial and final great circle courses and distance.

$$\cot \frac{1}{2}\lambda \cos \frac{1}{2}(L_1 \sim L_2) = \cos \left\{ 90^\circ - \frac{1}{2}(L_1 + L_2) \right\} \tan \frac{1}{2}(C_1 + C_2), \quad (18)$$

$$\cot \frac{1}{2}\lambda \cos \left\{ 90^\circ - \frac{1}{2}(L_1 \sim L_2) \right\} = \cos \frac{1}{2}(L_1 + L_2) \tan \frac{1}{2}(C_1 \sim C_2). \quad (19)$$

RUST'S AZIMUTH DIAGRAM

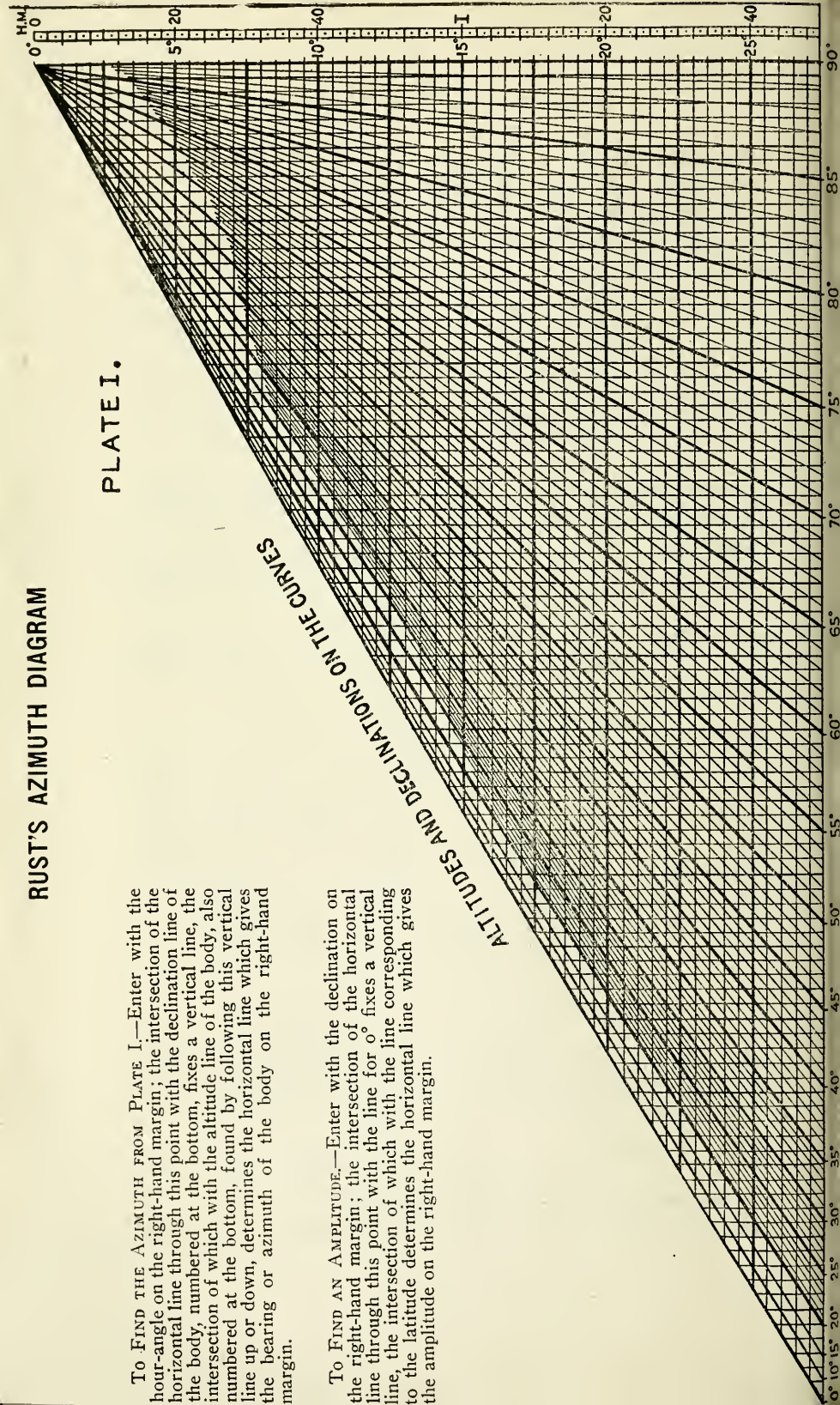
PLATE I.

To FIND THE AZIMUTH FROM PLATE I.—Enter with the hour-angle on the right-hand margin; the intersection of the horizontal line through this point with the declination line of the body, numbered at the bottom, fixes a vertical line, the intersection of which with the altitude line of the body, also numbered at the bottom, found by following this vertical line up or down, determines the horizontal line which gives the bearing or azimuth of the body on the right-hand margin.

To FIND AN AMPLITUDE.—Enter with the declination on the right-hand margin; the intersection of the horizontal line through this point with the line for 0° fixes a vertical line, the intersection of which with the line corresponding to the latitude determines the horizontal line which gives the amplitude on the right-hand margin.

ALTITUDES AND DECLINATIONS ON THE CURVES

AZIMUTHS AND HOUR ANGLES



(1) Set $\frac{1}{2}(L_1 \sim L_2)$ on scale P to $\frac{1}{2}\lambda$ on scale N and find the angle X on scale R opposite $90^\circ - \frac{1}{2}(L_1 + L_2)$ on scale Q .

(2) Set $90^\circ - \frac{1}{2}(L_1 \sim L_2)$ on scale P to $\frac{1}{2}\lambda$ on scale N and find the angle Y on scale R opposite $\frac{1}{2}(L_1 + L_2)$ on scale Q .

(3) L_1 and L_2 being of the same name:

When $L_1 > L_2$: $C_1 = X + Y$ and $C_2 = X \sim Y$.

When $L_1 < L_2$: $C_1 = X \sim Y$ and $C_2 = X + Y$.

(4) Give C_1 the same name as L_1 and mark it E. or W. to correspond to the direction of the ship.

(5) When V is "in," give C_2 the contrary name to L_1 and mark it E. or W. like C_1 , when V is "out," give C_2 the same name as L_1 .

(6) In formulas (18) and (19) mark L_1 and $L_2 +$ when of the same name; otherwise mark $L_2 -$.

(7) In (1) when $L_2 > L_1$ and of the contrary name, use $90^\circ - \frac{1}{2}(L_2 - L_1)$ on scale Q , and X is the supplement of the angle X' found on scale R .

(8) When L_1 and L_2 are of contrary names, $C_1 = X + Y$ and $C_2 = X \sim Y$ in all cases.

(9) To find the great circle distance. When L_1 and L_2 are of the same name, set X on scale P to $\frac{1}{2}(L_1 + L_2)$ on scale N and find $\frac{1}{2}D$ on scale R opposite Y on scale Q . If L_1 and L_2 are of contrary names use $\frac{1}{2}(L_1 \sim L_2)$ in place of $\frac{1}{2}(L_1 + L_2)$. When $X > 90^\circ$, use $180^\circ - X$, or X' .

(10) When L_1 and L_2 are of contrary names, $(L_1 \sim L_2)$ and $(L_1 + L_2)$ in (1) and (2) become $(L_1 + L_2)$ and $(L_1 \sim L_2)$, respectively.

Example 24.—Find the initial and final courses from A in $L_1 = 51^\circ 26' \text{ N.}$, Long. $9^\circ 29' \text{ W.}$, to B in $L_2 = 46^\circ 39' \text{ N.}$, Long. $53^\circ 4' \text{ W.}$ *Ans.* $C_1 = \text{N. } 82^\circ 7' \text{ W.}$; $C_2 = \text{S. } 64^\circ 7' \text{ W.}$

(a)	$\frac{1}{2}\lambda = 21^\circ 47'$	(a)	$\frac{1}{2}\lambda = 21^\circ 47'$
X (b)	$\frac{1}{2}(L_1 - L_2) = 2^\circ 23'$	Y (d)	$90^\circ - \frac{1}{2}(L_1 - L_2) = 87^\circ 37'$
(c)	$90^\circ - \frac{1}{2}(L_1 + L_2) = 40^\circ 57'$	(e)	$\frac{1}{2}(L_1 + L_2) = 49^\circ 03'$
	$X = 73^\circ 7'$		$Y = 9^\circ$
$C_1 = X + Y = 82^\circ 7'$ and $C_2 = X - Y = 64^\circ 7'$.			

Example 25.—Find C_1 , C_2 and D from A in $L_1 = 6^\circ 2' \text{ N.}$; Long. $80^\circ 13' \text{ E.}$, to B in $L_2 = 35^\circ 2' \text{ S.}$, Long. $117^\circ 54' \text{ E.}$

Ans. $C_1 = \text{N. } 141^\circ 56' \text{ E.}$; $C_2 = \text{S. } 48^\circ 26' \text{ E.}$; $D = 3254 \text{ miles.}$

$$\begin{array}{ll}
 (a) & \frac{1}{2}\lambda = 18^\circ 50' \\
 X' (b) & \frac{1}{2}(L_1 + L_2) = 20^\circ 32' \quad Y (d) \quad 90^\circ - \frac{1}{2}(L_1 + L_2) = 69^\circ 28' \\
 (c) & 90^\circ - \frac{1}{2}(L_2 - L_1) = 75^\circ 30' \quad (e) \quad \frac{1}{2}(L_2 - L_1) = 14^\circ 30' \\
 X' = 84^\circ 49'; & X = 180^\circ - X' = 95^\circ 11'; \quad Y = 46^\circ 45'; \\
 & C_1 = X + Y = 141^\circ 56'; \quad C_2 = X - Y = 48^\circ 26'.
 \end{array}$$

From (9), $D = 3254$ miles.

THE IDENTIFICATION OF STARS

PROBLEM 16.—Given the true altitude and azimuth of an unknown star, reckoned from the elevated pole, and the latitude of the observer to find the hour-angle and declination of the star.

$$\cot \frac{1}{2}Z \cos \frac{1}{2}(L \sim h) = \cos \{90^\circ - \frac{1}{2}(L + h)\} \tan \frac{1}{2}(t + M), \quad (20)$$

$$\cot \frac{1}{2}Z \cos \{90^\circ - \frac{1}{2}(L \sim h)\} = \cos \frac{1}{2}(L + h) \tan \frac{1}{2}(t \sim M). \quad (21)$$

(1) Set $\frac{1}{2}(L \sim h)$ on scale P to $\frac{1}{2}Z$ on scale N and find the angle X on scale R opposite $90^\circ - \frac{1}{2}(L + h)$ on scale Q .

(2) Set $90^\circ - \frac{1}{2}(L \sim h)$ on scale P to $\frac{1}{2}Z$ on scale N and find the angle Y on scale R opposite $\frac{1}{2}(L + h)$ on scale Q .

(3) When $L > h$, $t = X + Y$ and $M = X \sim Y$. When $L < h$, $t = X \sim Y$ and $M = X + Y$.

(4) When the body is west of the observer's meridian mark the hour-angle t , + when east, mark t -. Consider both L and h + in the above formulas, (20) and (21).

(5) To find the declination of the star. Set X on scale P to $\frac{1}{2}(L + h)$ on scale N and find $\frac{1}{2}p$ on scale R opposite Y on scale Q . When $X > 90^\circ$, use $180^\circ - X$, or X' . When $p > 90^\circ$ then $d = p - 90^\circ$, and is of the contrary name to L . When $p < 90^\circ$, then $d = 90^\circ - p$, and is of the same name as L .

Example 26.—At sea, February 26, 1901, 6.30 p. m., L. M. T. Weather overcast and cloudy. The altitude of an unknown star observed through a rift in the clouds was $29^\circ 30'$ (true) bearing N. 74° W. Lat. by D. R. 35° N.; Long. 60° W. Find the hour-angle of the star.

$$\begin{array}{ll}
 (a) & \frac{1}{2}Z = 37^\circ 00' \\
 X (b) & \frac{1}{2}(L - h) = 2^\circ 45' \quad Y (d) \quad 90^\circ - \frac{1}{2}(L - h) = 87^\circ 15' \\
 (c) & 90^\circ - \frac{1}{2}(L + h) = 57^\circ 45' \quad (e) \quad \frac{1}{2}(L + h) = 32^\circ 15' \\
 & X = 68^\circ \quad Y = 4^\circ 18'
 \end{array}$$

$$\text{As } L > h, \quad t = X + Y = 72^\circ 18' = 4^h 49^m 12^s \text{ (west).}$$

From (5), $p = 62^\circ$ and $d = 28^\circ$ and is marked N. because $p < 90^\circ$.

PROBLEM 17.—Given the latitude and longitude of the observer, the hour-angle and altitude of an unknown star, and the time of observation to find its right ascension and declination, with Rule I.

(1) When the star is east of the observer's meridian add its hour-angle to the L. S. T. to obtain the R. A. of the star; when west subtract it from the L. S. T.

(2) Set h on scale C to Z on scale D and find d on scale B opposite t on scale A . (Use Rule I or V.)

NAMING THE DECLINATION

There will be no difficulty in determining the name of the declination except when the declination is small, or when the star is near the equator. In all cases the sign of the declination may be readily determined by Table I, for which the writer is indebted to Commander H. L. Rice, U. S. Navy.

TABLE I—VALUES OF Q

Altitudes	For azimuths North toward West or North toward East										Altitudes
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	
0	0	0	0	0	0	0	0	0	0	0	0
10	16.0	16.0	15.9	15.7	15.4	14.9	14.1	12.5	8.9	0.0	10
20	14.0	13.9	13.8	13.4	12.9	12.2	10.8	8.6	5.1	0.0	20
30	12.0	11.9	11.7	11.3	10.6	9.6	8.2	6.1	3.3	0.0	30
40	10.0	9.9	9.6	9.2	8.5	7.5	6.2	4.4	2.3	0.0	40
50	8.0	7.9	7.7	7.2	6.5	5.7	4.6	3.2	1.7	0.0	50
60	6.0	5.9	5.7	5.3	4.8	4.1	3.2	2.2	1.1	0.0	60
70	4.0	3.9	3.8	3.5	3.1	2.6	2.1	1.4	0.7	0.0	70
80	2.0	2.0	1.9	1.7	1.5	1.3	1.0	0.7	0.4	0.0	80
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90
Altitudes	For azimuths South toward West or South toward East										Altitudes
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	

Express the latitude in degrees and tenths as Q in the table.

Mark north latitude + and south latitude —.

When the azimuth is found at the top of the table, Q is +.

When the azimuth is found at the bottom of the table, Q is —.

The declination has the sign of $Q + \frac{\text{latitude}}{5}$.

TO FIND THE DECLINATION

Example 27.—At sea, in Long. 60° W., February 26, 1901, the hour-angle of an unknown star was $4^h 49^m 12^s$, bearing N. 74° W.,

and its true altitude was $29^{\circ} 30'$. Find its R. A. and declination and the name of the star.

	^h	^m	^s	
L. M. T.	6	30	00	By (2), Problem 17, we find $d = 28^{\circ}$
R. A. M. S.	22	22	33	$35'$, using Rule V, and by Table I d is
Cor. G. M. T.		1	43	found to be + or north.
L. S. T.	4	54	16	Star's R. A. $0^h 05^m 04^s$
Star's H. A.	4	49	12	Star's Dec. $28^{\circ} 35' N.$
Star's R. A.	0	05	04	These show the star observed was
				α Andromedæ.

RULE VI

PROBLEM 18.—The “time sight.” Given the latitude of the observer, the true altitude and corrected declination of a celestial body, to find its hour-angle.

Add together the log secants of L and d taken from Table II.

Set $s = \frac{1}{2}(h + L + p)$ on scale T to $(s - h)$ on scale S and find the hour-angle t on scale W opposite the sum of the log secants of L and d on scale V .

Example 28.— $h = 48^{\circ} 53'$; $L = 30^{\circ} 20.5' N.$; $d = 22^{\circ} 0.8' N.$

h	$48^{\circ} 53'$	$p = 90^{\circ} - d$	$L = 30^{\circ} 20.5'$	log sec 0.0639
L	$30 \quad 20.5$	$= 67^{\circ} 59.2'$	$d = 22 \quad 00.8$	log sec 0.0329
p	$67 \quad 59.2$			Sum 0.0968
$2s$	$147 \quad 12.7$			
s	$73 \quad 36.3$			
h	$48 \quad 53$			
$s - h$	$24 \quad 43.3$			

Following the directions given above, we find $t = 3^h 00^m 38^s$.

PROBLEM 19.—The “altitude azimuth.” Given the latitude of the observer and the true latitude and corrected declination of a celestial body, to find its azimuth.

Add together the log secants of L and h . Set $s = \frac{1}{2}(L + z \pm d)$ on scale T to $(s \mp d)$ on scale S and find Z on scale W opposite to $(\log \sec L + \log \sec h)$ on scale V .

(1) The upper signs in the above expressions are used when L and d are of the same name and the lower when they are of contrary names.

Enter at top for Secants.										Minutes for Log Secants										Diff's. for minutes—Add									
Sec.	0'	10'	20'	30'	40'	50'		Sec	0'	10'	20'	30'	40'	50'		1'	2'	3'	4'	5'	6'	7'	8'	9'					
0	0.0000	0000	0000	0000	0000	0000	89°	1°	0.0001	0001	0001	0002	0002	0002	88°	..	..	..	..	..	..	..	..	..
2	0.0003	0003	0004	0004	0005	0006	87	3	0.0006	0007	0007	0008	0009	0010	86	..	..	..	..	..	..	..	..	..
4	0.0011	0012	0014	0014	0016	0018	85	5	0.0017	0018	0019	0020	0021	0023	84	..	..	..	..	..	..	..	..	..
6	0.0024	0025	0027	0028	0030	0031	83	7	0.0033	0034	0036	0037	0039	0041	82	..	..	..	..	..	..	..	..	..
8	0.0042	0044	0046	0048	0050	0052	81	9	8.0054	0050	0058	0060	0062	0064	80	..	..	..	..	..	..	..	..	..
10	0.0066	0069	0071	0073	0076	0078	79	11	0.0080	0083	0085	0088	0091	0093	78	..	..	..	..	..	..	..	..	..
12	0.0096	0099	0101	0104	0107	0110	77	13	0.0113	0116	0119	0122	0125	0128	76	..	..	..	..	..	..	..	..	..
14	0.0131	0134	0137	0141	0144	0147	75	15	0.0151	0154	0157	0161	0164	0168	74	..	..	..	..	..	..	..	..	..
16	0.0172	0175	0179	0183	0186	0190	73	17	0.0194	0198	0202	0206	0210	0214	72	..	..	..	..	..	..	..	..	..
18	0.0218	0222	0226	0230	0235	0239	71	19	0.0243	0248	0252	0256	0261	0266	70	..	..	..	..	..	..	..	..	..
20	0.0270	0275	0279	0284	0289	0294	69	21	0.0298	0303	0308	0313	0318	0323	68	..	..	..	..	..	..	..	..	..
22	0.0328	0333	0339	0344	0349	0354	67	23	0.0360	0365	0371	0376	0381	0387	66	..	..	..	..	..	..	..	..	..
24	0.0393	0398	0404	0410	0416	0421	65	25	0.0427	0433	0439	0445	0451	0457	64	..	..	..	..	..	..	..	..	..
26	0.0463	0470	0476	0482	0488	0495	63	27	0.0501	0508	0514	0521	0527	0534	62	..	..	..	..	..	..	..	..	..
28	0.0541	0547	0554	0561	0568	0575	61	29	0.0582	0589	0596	0603	0610	0617	60	..	..	..	..	..	..	..	..	..
30	0.0625	0632	0639	0647	0654	0662	59	31	0.0669	0677	0685	0692	0700	0708	58	..	..	..	..	..	..	..	..	..
32	0.0716	0724	0732	0740	0748	0756	57	33	0.0764	0772	0781	0789	0797	0806	56	..	..	..	..	..	..	..	..	..
34	0.0814	0823	0831	0840	0849	0857	55	35	0.0866	0875	0884	0893	0902	0911	54	..	..	..	..	..	..	..	..	..
36	0.0920	0930	0939	0948	0958	0967	53	37	0.0976	0986	0996	1005	1015	1025	52	..	..	..	..	..	..	..	..	..
38	0.1035	1045	1054	1065	1075	1085	51	39	0.1095	1105	1116	1126	1136	1147	50	..	..	..	..	..	..	..	..	..
40	0.1157	1168	1179	1189	1200	1211	49	41	0.1222	1233	1244	1255	1267	1278	48	..	..	..	..	..	..	..	..	..
42	0.1280	1301	1312	1324	1335	1347	47	43	0.1359	1370	1382	1394	1406	1418	46	..	..	..	..	..	..	..	..	..
44	0.1431	1443	1455	1468	1480	1493	45	45	0.1505	1518	1531	1543	1556	1569	44	..	..	..	..	..	..	..	..	..
46	0.1582	1595	1609	1622	1635	1649	43	47	0.1662	1676	1689	1703	1717	1731	42	..	..	..	..	..	..	..	..	..
48	0.1745	1759	1773	1787	1802	1816	41	49	0.1831	1845	1860	1875	1889	1904	40	..	..	..	..	..	..	..	..	..
50	0.1919	1934	1950	1965	1980	1996	39	51	0.2011	2027	2043	2058	2074	2090	38	..	..	..	..	..	..	..	..	..
52	0.2107	2123	2139	2155	2172	2189	37	53	0.2205	2222	2239	2256	2273	2290	36	..	..	..	..	..	..	..	..	..
54	0.2308	2325	2343	2360	2378	2396	35	55	0.2414	2432	2450	2468	2487	2506	34	..	..	..	..	..	..	..	..	..
56	0.2524	2543	2562	2581	2600	2619	33	57	0.2639	2658	2678	2698	2718	2738	32	..	..	..	..	..	..	..	..	..
58	0.2758	2778	2799	2819	2840	2861	31	59	0.2882	2903	2924	2945	2967	2988	30	..	..	..	..	..	..	..	..	..
60	0.3010	3032	3054	3077	3099	3122	29	61	0.3144	3167	3190	3213	3237	3260	28	..	..	..	..	..	..	..	..	..
62	0.3284	3308	3332	3356	3380	3405	27	63	0.3429	3454	3479	3505	3530	3556	26	..	..	..	..	..	..	..	..	..
64	0.3582	3608	3634	3660	3687	3714	25	65	0.3741	3768	3795	3823	3851	3879	24	..	..	..	..	..	..	..	..	..
66	0.3907	3935	3964	3993	4022	4052	23	67	0.4081	4111	4141	4172	4202	4233	22	..	..	..	..	..	..	..	..	..
68	0.4264	4296	4327	4359	4392	4424	21	69	0.4457	4490	4523	4557	4591	4625	20	..	..	..	..	..	..	..	..	..
70	0.4660	4694	4730	4765	4801	4837	19	71	0.4874	4910	4948	4985	5023	5062	18	..	..	..	..	..	..	..	..	..
72	0.5100	5139	5179	5219	5259	5300	17	73	0.5341	5382	5424	5467	5510	5553	16	..	..	..	..	..	..	..	..	..
74	0.5597	5641	5686	5731	5777	5823	15	75	0.5870	5918	5965	6014	6063	6113	14	..	..	..	..	..	..	..	..	..
76	0.6103	6214	6266	6318	6371	6425	13	77	0.6479	6534	6590	6647	6704	6762	12	..	..	..	..	..	..	..	..	..
										Coscc										Coscc									
										Enter at bottom for Coscants										Diff's. for minutes—Subtract									
Minutes for Log Coscants.										Enter at bottom for Coscants										Diff's. for minutes—Subtract									
Sec.	0'	10'	20'	30'	40'	50'		Sec	0'	10'	20'	30'	40'	50'		1'	2'	3'	4'	5'	6'	7'	8'	9'					

(2) The azimuth is given the same name as the latitude of the observer and is marked E. when the body is east of the observer's meridian; otherwise W.

Example 29.—Lat. $21^{\circ} 30' \text{ N.}$, Dec. $11^{\circ} 30' \text{ S.}$, and altitude of the sun's center 30° . Find the azimuth, the sun being west of the meridian.

$L \ 21^{\circ} 30' \text{ N.}$	$z = 90^{\circ} - h = 60^{\circ}$	$L = 21^{\circ} 30' \log \sec 0.0313$
$z \ 60 \ 00$		$h = 30 \ 00 \log \sec 0.0625$
$\quad 81 \ 30$		Sum 0.0938
$d \ 11 \ 00 \text{ S.}$		
$2s \ 70 \ 00$	Following the directions given above, we	
$s \ 35 \ 00$	find $Z = 7^{\text{h}} 53^{\text{m}} = \text{N. } 118^{\circ} 15' \text{ W.}$	
$d \ 11 \ 30 \text{ S.}$		
$s + d \ 46 \ 30$		

PROBLEM 20. Given the latitudes of the points of departure and destination with the G. C. D. between them, to find the initial and final G. C. courses.

(1) To find the initial course:

Set $s = \frac{1}{2}(L_1 + D \pm L_2)$ on scale T to $(s \mp L_2)$ on scale S and find C_1 on scale W opposite $(\log \sec L_1 + \log \operatorname{cosec} D)$ on scale V .

(2) To find the final course:

Set $s = \frac{1}{2}(L_1 + D \pm L_2)$ on scale T to $(s \mp L_1)$ on scale S and find C_2 on scale W opposite $(\log \sec L_2 + \log \operatorname{cosec} D)$ on scale V .

In the above expressions use the upper signs when L_1 and L_2 have the same name and the lower signs when they have the contrary names.

Give C_1 and C_2 the names L_1 and L_2 , respectively; C_2 is thus reckoned as an initial course, reverse its direction for the final course.

Example 30.—Find the initial and final courses from Wolf Rock, Lat. $49^{\circ} 57' \text{ N.}$, Long. $5^{\circ} 48' \text{ W.}$, to Charleston, S. C., Lat. $32^{\circ} 45' \text{ N.}$, Long. $79^{\circ} 52' \text{ W.}$; G. C. D. = 3346 miles = $55^{\circ} 46'$.

$L_1 \ 49^{\circ} 57'$	log sec	0.1914
$D \ 55 \ 46$	log cosec	0.0826
$L_2 \ 32 \ 45$	Sum	0.2740
$2s \ 138 \ 28$		
$s \ 69 \ 14$		
$L_2 \ 32 \ 45$		
$s - L_2 \ 36 \ 29$		

Following the directions given above, we find $C_1 = 5^{\text{h}} 12^{\text{m}} 22^{\text{s}} = \text{N. } 78^{\circ} 5' \text{ W.}$

L_2	$32^\circ 45'$	log sec	0.0752
D	$55 \ 46$	log cosec	0.0826
L_1	$49 \ 57$	Sum	0.1578

2s 138 28

s 69 14

L_1 49 57

s- L_1 19 17

Following the directions given above, we
find $C_2 = S. 48^\circ 28' W.$

RULE VII

PROBLEM 21.—The “Marc Saint-Hilaire Method.”

Given the longitude and latitude L of P , the assumed position of the ship, the true altitude of the observed body h , its hour-angle t , and declination d , to find the altitude difference A. D., and the sign of its application to the computed zenith distance z' .

(1) Set L on scale b to t on scale a and find θ on scale f opposite d on scale e .

(2) With θ on scale d find nat hav θ on scale c , take also nat hav $(L \mp d)$ from scale c . Nat hav $\theta + \text{nat hav}(L \mp d) = \text{nat hav } z'$.

(3) With nat hav z' on scale c find z' on scale d .

(4) $h' = 90^\circ - z'$ and A. D. $= h' - h$. When A. D. is $+$ it is laid off along the line of azimuth *away* from the body, and when A. D. is $-$ it must be laid off *towards* the body. We thus establish P' , a point on the line of position though which a line is drawn at right angle to the line of azimuth.

Example 31.—At sea, Nov. 9, 1888, about 2.30 p. m. Lat. $34^\circ 30' N.$; Long. $65^\circ 40' W.$ True altitude moon's center was $20^\circ 11' 36''$, bearing to S'd and E'd; W. T. Obs. $2^h 28^m 54^s$; $C-W = 4^h 14^m 5^s$; C. C. $- 3^m 48^s$; moon's correct R. A. $20^h 37^m 33^s$; correct declination $19^\circ 51' S.$ Find the altitude difference A. D., and the bearing of the moon.

Here	t $3^h 3^m 35^s$ (east) (a)	$z' = 69^\circ 42'$
	L $34^\circ 30' N.$ (b)	90
	d $19^\circ 51' S.$ (e)	$h' = 20 \ 18$
	θ $40^\circ 10'$ (f)	$h = 20 \ 11.6$
	nat hav θ .1180 (c) (d)	A. D. $= + \ 6.4$, away from
	nat hav $(L + d)$.2086 (c) (d)	the moon.
	nat hav z' .3266 (c) (d)	

With Rule I we find $Z = N. 134^\circ 10' E.$, or the moon bears $S. 45^\circ 50' E.$ The letters in parentheses indicate the scales to be used.

PROBLEM 22.—To find the great circle distance.

Given the latitudes L_1 and L_2 of A and B , the points of departure and destination, and the difference of longitude λ between their meridians. Find the great circle distance D from A to B .

(1) Set L_1 on scale b to λ on scale a and find a on scale f opposite L_2 on scale e .

(2) With a on scale d find $\text{nat hav } a$ on scale c , also take $\text{nat hav } (L_1 \mp L_2)$ from scale c . $\text{Nat hav } a + \text{nat hav } (L_1 \mp L_2) = \text{nat hav } D$.

(3) With $\text{nat hav } D$ on scale c , find D on scale d .

Example 32.—

A: Lat. $32^\circ 00' \text{ S.}$
Long. $165^\circ 45' \text{ E.}$

B: Lat. $36^\circ 00' \text{ N.}$
Long. $123^\circ 00' \text{ W.}$

Find the great circle distance D .

Here	$\lambda \ 71^\circ 15' \text{ (a)}$	By following the directions
	$L_1 \ 32^\circ 15' \text{ S. (b)}$	given above we find
	$L_2 \ 36^\circ 00' \text{ N. (e)}$	$D = 5712 \text{ miles.}$
	$a \ 57^\circ 42' \text{ (f)}$	
	$\text{nat hav } a \ 0.2325 \text{ (c) (d)}$	
	$\text{nat hav } (L_1 + L_2) \ 0.3126 \text{ (c) (d)}$	
	$\text{nat hav } D \ 0.5451 \text{ (c) (d)}$	
	$D \ 95^\circ 12' \text{ (c) (d)}$	
	5712 miles.	

PROBLEM 23.—Given the latitude L , the true altitude h , and azimuth Z , of an unknown star, to find its declination and hour-angle.

(1) Set L on scale b to Z (expressed in h , m and s) on scale a and find β on scale f opposite h on scale e .

(2) With β on scale d find $\text{nat hav } \beta$ on scale c . Also take $\text{nat hav } (L \sim h)$ from scale c , $\text{nat hav } \beta + \text{nat hav } (L \sim h) = \text{nat hav } p$.

(3) With $\text{nat hav } p$ on scale c , find p on scale d .

(4) When $p < 90^\circ$, d has the same name as the latitude, and $d = 90^\circ - p$.

(5) When $p > 90^\circ$, d has the contrary name to the latitude and $d = p - 90^\circ$.

(6) Find the hour-angle with Rule I thus: Set h on scale C to Z on scale D and find t on scale A opposite d on scale B .

Example 33.—At sea, Lat. $11^\circ 37' \text{ N.}$, Long. $81^\circ 9' \text{ W.}$, about 5.30 a. m. The true altitude of an unknown star, seen through a

rift in the clouds, was $25^{\circ} 55'$, bearing N. 115° E. Find the declination, the hour-angle of the star and its name. G. S. T. of obr. = $8^h 12^m 17^s$.

Ans. $p = 106^{\circ} 37'$, hence $d = 16^{\circ} 37'$ S., $t = 3^h 53^m 30^s$.

R.A. = $6^h 41^m 11^s$, and the star is α Canis Majoris (Sirius).

DIRECTIONS FOR CONSTRUCTING THE SLIDE RULES

These should be mounted so that Rules I to V form one set and Rules VI and VII the other.

Paste the first set on good stiff cardboard, using good mucilage and not photo paste. Spread the mucilage on the cardboard with a good brush about 2" wide, and place the print over it and rub down quickly and evenly, first very lightly lengthwise, then cross-wise so as not to stretch the paper. Use a blotter or piece of paper between the print and cloth. Weight down the cardboard and let it dry.

With a safety-razor blade and a steel straight-edge or a carpenter's square to guide it, cut the inner scales B , C , F , G , etc., from the mounted print. Or if convenient have the mounted print cut into strips with a stationer's paper-cutting machine.

Provide sufficient cardboard of the same thickness and about 26" wide, to have a base 8" x 26", on which to mount the scales, and to make covering pieces and filling pieces.

Assemble these various parts, as shown in Fig. 5, by laying the filling piece 2 in the position shown and make a mark along its inner edge with a sharp pencil. Spread mucilage evenly on the base 1, leaving a margin of $\frac{1}{8}$ " from line p . Put mucilage also on piece 2, leaving $\frac{1}{8}$ " margin from its inner edge. Place 2 on 1 and weight it down to set.

Next spread mucilage on top of 2 and on bottom of 3, leaving $\frac{1}{8}$ " margin from n . Place 3 on 2 and weight down to set. Next slip the slide 4 under 3 and move it back and forth to see that there is no excess of mucilage. Press 4 gently up against 2 and make a pencil line along the edges m and q . Remove 4 and spread mucilage evenly on the bottom of 5 and top of 4, leaving $\frac{1}{8}$ " margins at m and q . Place 5 carefully on 4, rub down, and place the slide in the position shown in the figure. Move it back and forth and see that the edges A and B coincide their full length. Mark the lines r , s , t and u . Put 6 in place and move the slide back and

forth. Then place 7 in position and press it gently against 5 until the edges *C* and *D* coincide throughout. Move the slide back and forth until it moves freely.

Weight with books and set aside to dry.

In the same way assemble Rules II, III, IV and V.

It is important that the outside scales *A* and *D* should be lined up exactly as shown on the print. This may be easily done by setting the slide to scale *A* as it was originally and lining scale *D* up by it. After the rules have been assembled on the base it should be glued, or secured with thumb tacks to a piece of $\frac{3}{4}$ " board.

While it is intended to have these slide rules printed on cardboard, all of the examples in this paper under Rules I, II, III, IV and V were solved with a set of rules made as shown above. The

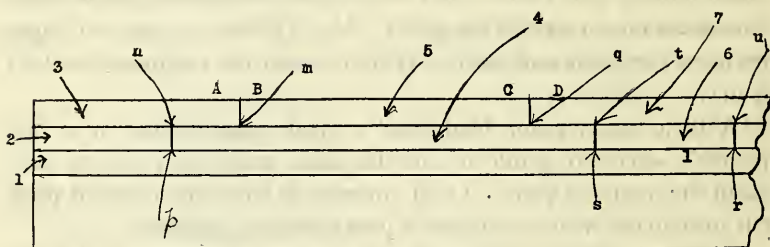


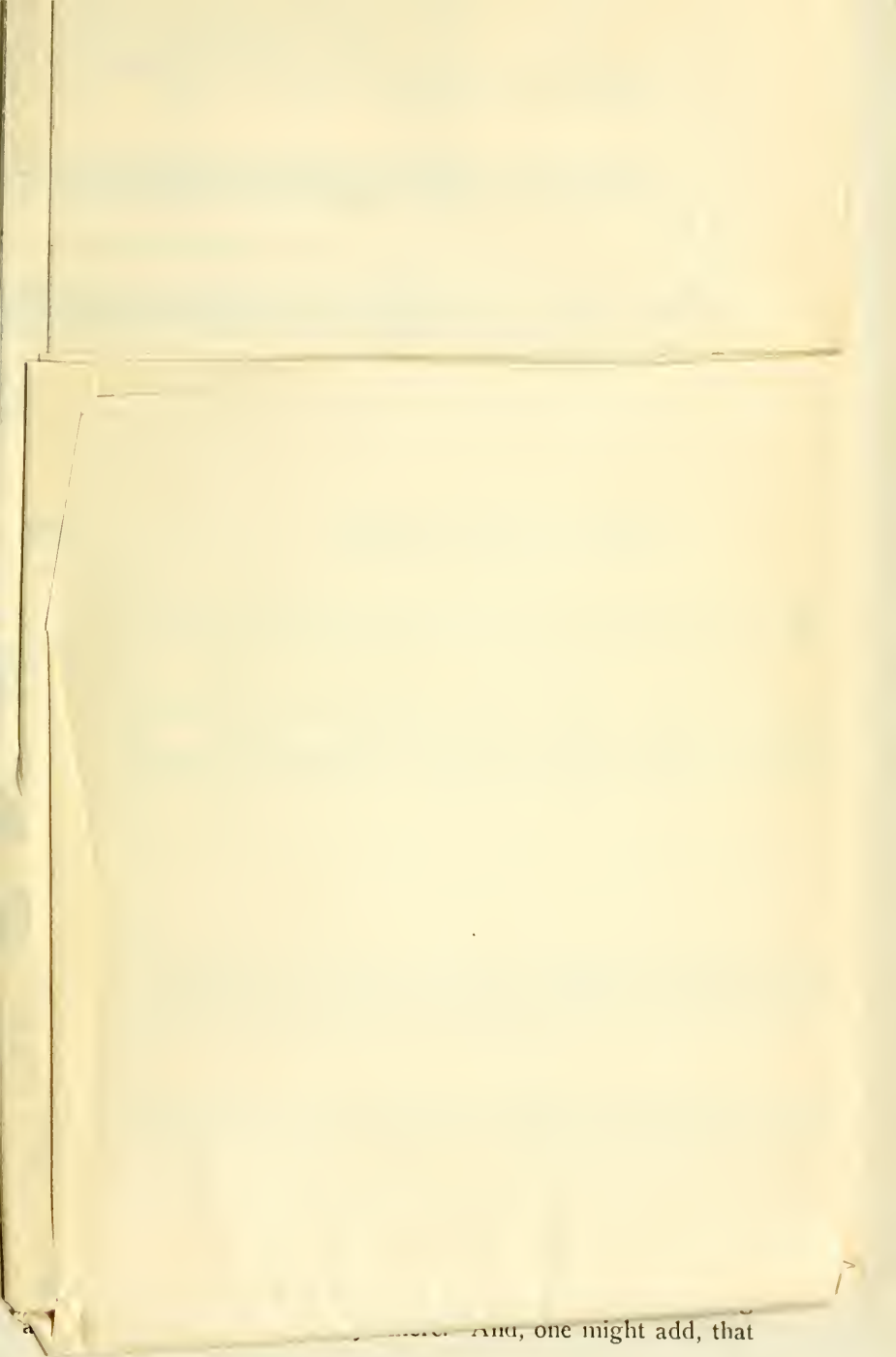
FIG. 5.

results compare favorably with those obtained by computation and are sufficiently accurate for practical navigation.

To obtain accurate results with Rules VI and VII, however, these should be printed on cardboard, as a slight uneven distortion of the paper when working to seconds of time will of course, materially affect the result.

If the rules be assembled as directed above, the navigator can, with the expenditure of a small amount of labor and care, make himself a set of slide rules which, for all practical purposes, will be just as good as though they had been made by an instrument maker at a cost that would in all probability put them far beyond his reach.

It would probably be better to make Rules VI and VII on discs so as to have the scales much longer without making the rules unwieldy. The writer hopes to accomplish this at some future time.



And, one might add, that

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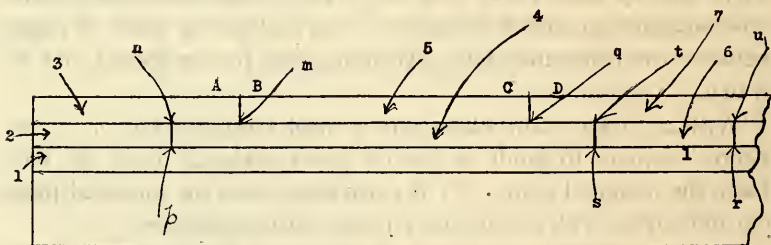


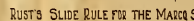
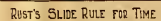
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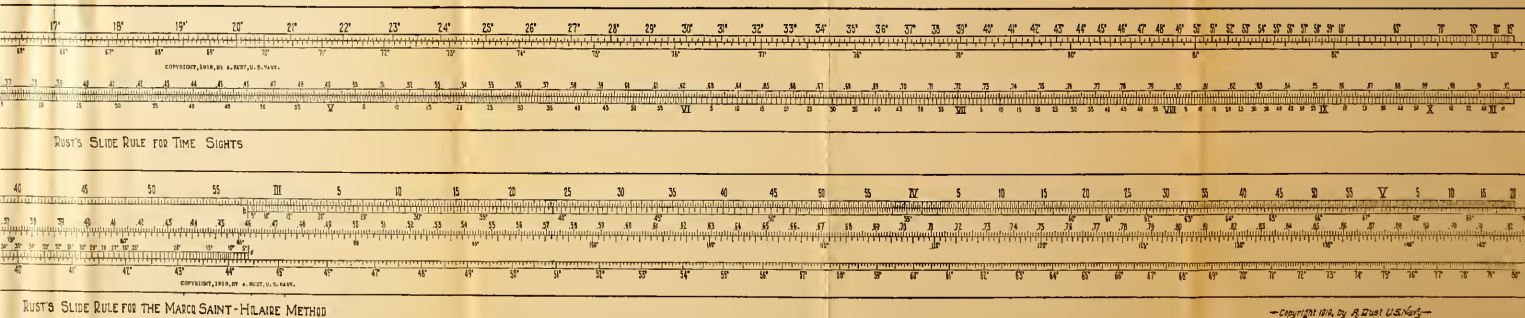
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LES FOR NAVIGATORS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

MORALE FOR OUR "NEW NAVY"

By ENSIGN (T) R. E. KRAUSE, U. S. Navy

There have been times in the history of our navy when, in order to meet an emergency, the interest and research of the naval personnel was directed into unusual channels. This was of course beneficial, but it was never quite clear when this deficiency had been met. Not that we had overdeveloped any particular phase but it was a case of having neglected something of vital importance. Shortly before the Spanish-American War we began to build our first modern battleships. Naturally enough, the interest of the officers turned to the planning and construction of these vessels, as well as to the guns with which to arm them. In short, we were providing the material. Later Admirals Mahan and Sims, in turn, pointed out to us that we had the weapons but were not proficient in their use. So to this day our officers have been striving to increase the skill of the naval personnel in the handling of the guns, torpedoes, engines, radio, etc., with what results we all know.

We are now due to pass to another period in which we shall have to devote increased attention to morale building. It is hoped that we are on a par with foreign countries as regards material and skill, so that we can let them rest for the moment and give our best to improving the spirit of the men. Morale is essential to a fighting force—for without it a fleet is beaten before the battle no matter how fine their ships and guns are. It resolves itself again into having our choice between a navy of "iron ships and wooden men" or one composed of "wooden ships and iron men." After mature reflection, no doubt most of us would prefer the latter. Fortunately morale, if not present, can be created. In our history the navy has never felt a similar need for creating a fighting spirit—it was always there. And, one might add, that

was about all we had at the beginning. Many was the time that the morale of our bluejackets won over the superior numbers and gun power of the British. We are prone to forget that the spirit which won victories for us in the days of the Revolution, the War of 1812, and the Civil War, has lost none of its power to win them for us in the future.

Some think that naval science has reached such a height that victory no longer is dependent on the morale of the personnel, but the two most recent great wars of the world strikingly refute this argument. In the Russo-Japanese War the outstanding element which won the battles for the Japanese was not a superiority of material or numbers but *morale*, in which the Russians were decidedly lacking. Lack of initiative was so general among the latter as to appear almost a national quality and similarly the lack of moral courage as shown by their leaders. At Tsushima while the Russians were deciding whether to fight or not the Japanese forces pounced on them—defeating them while they were still pondering. A more recent instance is the war with Germany. Naval experts invariably admit that Germany was second to none in excellence of material and skill in handling the same, while most assert that she was superior to all others. Yet there was no determined attempt made to break through or to decisively engage the British fleet. From the first it was the purpose of the Admiralty to avoid a serious contact. This tended to break down the morale of the officers and men until, toward the end of the war, they would not go out. For three years her battle fleet lay idle. Not only was this idleness decidedly injurious but the men must have felt that they were the under-dog, since their leaders refused to give battle to the British. Meanwhile the latter were active, cruising back and forth, and battling with the waves of the North Sea—all of which served to keep the sailors on their mettle. So we find that even though material and skill have been highly developed, morale is just as important as ever as a decisive factor in war.

For the sake of clearness we may define morale as being the mental state of the individual with regard to courage, confidence, zeal, and self-reliance. Courage is divided into two entirely separate, though often allied, classes: moral and physical. Moral courage will lead one to display a fearlessness of responsibility with its possible consequences. It will allow an officer to be governed by

attendant circumstances, regardless of regulations and precedent. In any case which calls for independent action he will be guided by the best interests of the service. It tends to develop initiative, which is so important in a service which tends to make machines of men. Every day of our lives we kill initiative when we "request instructions," "request assignment of berth," "follow senior officer's motions," and carry out the regular routine. This is no doubt necessary but we should recognize its consequences by putting a premium on initiative wherever possible. Moral courage must be re-enforced by initiative. When an officer is led by sudden circumstances to disregard instructions, regulations, and precedent, he must have the power of mind to devise suitable means or methods that are better than the customary ones for that particular purpose. If he cannot do that his moral courage will avail him naught. Moral courage is an indispensable quality for a military leader; therefore it should be valued highly wherever found. History is replete with examples of victories won by an officer's power to break away from existing regulations or customs, and as many failures by officers who feared the responsibility. It won the day for the British at the battle of Cape St. Vincent when Nelson ordered his ship to be wore in order to prevent a junction between the weather and the lee ships of the Spanish fleet. He did this in utter disregard of existing instructions and precedent, with full knowledge of what would happen to him if he failed. He had no authority of any kind but he had the quick perception to see the danger and the good judgment to know what to do.

Every man in the service should possess physical courage. If he does not have it when he enlists it should be developed in him. Fortunately this is possible and not very difficult. Every man is by nature afraid of the unknown or unusual, which can be overcome by association with these hazards. Gradually it will wear off, even though not entirely, but sufficiently so that the man will not show and be influenced by his fear. That is physical courage. It is said that Frederick the Great fled from his first battle but after his "baptism of fire" he never allowed fear to get the better of him. Physical courage, as well as morale in general, is largely influenced by physical fitness. Strength of body, agility in action, soundness of health, with the power of enduring fatigue and hardship, increase in large measure a man's

confidence in himself and his superiority over those who possess these qualities to a lesser degree. For this purpose athletics and all manly sports should be encouraged as never before. Systematic development of all parts of the body should be instituted and a course prescribed for each man, using for this purpose outdoor sports as far as possible. In this as well as along other lines of naval effort the officers should be the leaders by setting an example for the men. In addition to promoting courage, physical fitness is necessary to keep one mentally fit, so as to be at all times in readiness to assimilate education. The body supplies the energy that runs the brain and the latter will not function properly if one is run down physically.

Morale building is a difficult and intricate subject, especially so because the mind of the average American naval officer does not run in that direction. Hard and fast rules may be set for the upkeep of material but not so for the personnel.

No argument is as powerful as a good example, which must be set by the officers. Men are easy to handle and respond readily if the officer knows how. A would-be leader of men must himself understand discipline—ready to obey his superior officer as willingly as he would have his men obey him. He must be a man of character and intellect, able to command respect. He must show initiative as well as determination in the performance of his duty with a spirit of cheerfulness and consideration. He never asks a man to do anything he would not do himself. In short he must be an example in the way of his professional efficiency, morale, discipline, clean-living, and temperance; then, and then only, will he be able to get the best out of his men.

Discipline goes hand in hand with morale. Times have changed and the type of men we are receiving into the naval service have changed as well. The methods of maintaining discipline, formerly employed, do not meet present day requirements. Punishment as a deterrent force and as an example is still frequently practised, but if the officer or man is to be retained in the service no degrading punishment should be visited upon him, such as would tend to destroy his self-respect or the estimation of him in the eyes of his shipmates. The brig should be the last resort for a man who is in any way disposed to brace himself and has a feeling of pride in himself or the naval service that can be appealed to.

Justice should be meted out in any case, be it officer or enlisted man committing the offense. The double standard of conduct for officers and enlisted men is far too much in evidence. Why an officer should not be called to account for committing certain offenses for which an enlisted man would get a summary court-martial in every case is inconceivable to all enlisted men, as the writer knows by personal observation. Nor can the writer even now, after eighteen months service as an officer, understand why this state of affairs should exist. If anything, an officer should be made to come up to a higher standard because he should know better. Pride in the service is little promoted as long as such conditions are tolerated. No gulf should exist between officers and enlisted men, but rather it should be a gradual progression upwards as a man qualifies for a higher grade by reason of his increased professional efficiency. It is well for us to remember that we are all men whatever our rank or rating. Treat your men as you would be treated were you in their position. Sometimes we become skeptical as to whether we are dealing with men or some other species of lower mentality. Every officer has come in contact with men whose brain mechanism he could not fathom. Sometimes it appears as if enlisted men don't use their brains and some officers take it that they don't think. That is far from the truth, as those of us who have bunked and messed with them know. Such officers who hold this erroneous opinion will never be successful as morale builders—as leaders of men. In cases like the above mentioned it just shows that the officers concerned have not made a study of men.

Mast, as it was formerly held, should be a custom of the past. It has been, and is yet to some extent, the practise to intimidate the men or to abridge their right to speak.

The captain of a certain vessel was holding mast and as usual had a line of more or less repentant sinners in front of him. A young seaman, in turn, stepped up, saluted, and jerked off his hat.

"You are charged with being absent over leave. What have you to say for yourself?" snarled the captain.

"Why, sir, I-a-."

"Shut up! Shut up! I'll get you for lying," bellowed the captain. "Five days solitary confinement. Next!"

Can you expect this seaman to be thrilled with pride in the service which tolerates such injustice? Do you think such a sys-

ten tends to promote the efficiency of our man-of-war's man and the naval service? Of course such methods will rarely be found employed at the present time but less flagrant ones are still in general use.

We now have on our hands the task of reorganizing the navy. Now is the time to sow the seeds for developing morale in our "New Navy," such as crowned the efforts of the British fleet during the time of Nelson with success. Many of our old men have left the service and the majority of our personnel is young and inexperienced. This is the time to mold them as we want them into efficient man-of-war's men, who take a pride in and love the service. Let us face the fact squarely that the responsibility will be ours if we fail. Let us all face the task like men—not by drinking toasts to the old navy that has gone by but by showing an increased zeal and devotion for our "New Navy," that will be better than the old.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PRACTICAL NAVAL OFFICER¹

By REAR ADMIRAL WM. S. SIMS, U. S. Navy,
President, Naval War College

At the reopening of the college after the end of the war, I delivered a short address to the class of June, 1919. If there was anything in that address that proved of benefit to that class, it should be equally useful to this class of December, 1919, which it is now my duty and pleasure to welcome. The logical course would therefore be for me to repeat the address for the benefit of the new class. But as that would be rather hard on the old class, which, being of six months standing, is probably somewhat restive under advice, I will spare them that affliction—but only upon the understanding that the new class will read the address in question, because I have therein invited attention to the specific mission of this college and to the means which I believe to be essential to the realization of that mission.

Seven years ago last month I delivered to the officers of the Naval Academy a lecture on the "Practical Character of the Naval War College." Those whom I consulted at the time advised me that the paper was a bit too elementary. Though somewhat inclined to the same opinion, I gave the lecture as it was written. Since that time I have had occasion to observe the service mind on this subject, both in peace and in war, and in consequence realize even more fully now than then the importance of doing everything possible to convince our officers of the absolute necessity not only of training in the art of war, but of training in systematic and logical thinking.

This necessity was brought home to me with tremendous force on more than one occasion during the war by certain failures of

¹Address delivered before the opening course for class of December, 1919, at the Naval War College, Newport, R. I., December 2, 1919.

officers to reach logical conclusions which imperilled the lives and property they were responsible for guarding. I will cite a typical example:

A valuable convoy was approaching a certain submarine zone. The problem was to protect it against the attack of enemy submarines. A certain inadequate number of destroyers was available for this purpose. On the way out to meet the convoy they were ordered to make a sweep of a very wide area across the zone—a distance of about 200 miles. Upon meeting the convoy, half the destroyers were to form its escort and the others were to continue the wide sweep at a considerable distance from the convoy.

In view of the fact that a destroyer is visible from a submarine many times as far away as the submarine is visible from the destroyer, and also that the U-boat can submerge at will in 30 seconds, it is apparent that the sweeping operations were not only a useless waste of fuel and energy, but that the convoy was needlessly imperilled by detaching half of its already insufficient escort.

We may be sure that any officer who had had adequate training in the systematic reasoning necessary to make correct estimates of simple situations could not possibly have been guilty of such a dangerous blunder.

There were not a few such blunders in the early part of the war, and in all cases that came to my notice they were made by so-called practical officers—that is, by officers who honestly and tenaciously held the extremely dangerous opinion that if they efficiently performed all their duties at sea throughout the various grades, they would thereby render themselves competent to perform the independent and responsible duties of the higher grades.

My principal object upon this occasion is to show the fallacy of that opinion, and to this end I will repeat the essential parts of the lecture above mentioned.

It contains some illustrations that would not be necessary in addressing experienced officers who have shown their appreciation of the college by their applications to take the course; but some of these illustrations have been retained because of the possible influence they may have upon our younger officers, and also upon those hard-headed men who do not yet understand that this institution is of practical value to the service. The lecture follows:

THE PRACTICAL CHARACTER OF THE NAVAL WAR COLLEGE

Twenty-seven years ago Admiral Mahan delivered an address, at the opening of the Naval War College in 1892, that bore the same title as this lecture. It was published in the Naval Institute in 1893. It is of course sound in every particular, and will repay a careful reading. It shows with entire conclusiveness that the study of the history of naval warfare is in no sense a theoretical proceeding, but essentially a practical one that is entirely indispensable as a preparation for actual conflict; but, as the war games and the applicatory system of training had not been introduced at that time, the address does not indicate the additional necessity for constant mental practice in the application of this knowledge of war by means of these games.

It will be one of the principal objects of this lecture to supply this omission, and to explain as clearly as possible not only the practical character of such studies but the imperative necessity of these mental training exercises.

One of the first things a student learns at the Naval War College is to appreciate the value of a systematic and logical method of arriving at a decision. Whenever we are given a task to perform, the college teaches us first to state our mission, then to make an estimate of the situation, and finally to form our decision or conclusion. I will try to adhere to this principle.

My present mission is to show that a knowledge of the art of war, and training in the application of this knowledge, are vitally necessary to success in naval warfare; and I hope to be able to indicate clearly how this knowledge and training may best be acquired by our officers.

The primary object of the Naval War College is to study the principles of warfare, as enunciated by the great masters of the art, to develop the practical application of these principles to war on the sea under modern conditions, and then to train our minds to a high degree of precision and rapidity of decision in the correct application of these principles.

In order to form a correct conclusion as to what should be done, it will be necessary to make a candid examination of where the service stands in reference to the important feature of preparation for war; that is, we must make an estimate of our present situation in this respect.

Such an estimate should show, as clearly as possible, the elements of preparation that are essential to success, wherein and to what degree we have failed to realize them, and what direction reform should take.

We all recognize the necessity of building a navy the individual units of which are as numerous, as well constructed, as fast, as well manned, as well trained, as well equipped, and as well supplied as the navies of our possible enemies; but perhaps we do not all quite fully realize that such a navy cannot reasonably be expected to succeed in war unless the man who directs the whole and the men who direct the various elements—the squadrons, divisions, flotillas, and individual ships—not only know the principles of the art of war, but have their minds trained in the application of these principles to such a degree that they will all be actuated by a common doctrine of war, which doctrine will enable them to coordinate their several actions in furthering the general plans of the commander-in-chief.

I say that the necessity for mental training is not yet fully realized by the service. Of course, all officers understand in a general way that we must know how to handle a great fleet if we expect to succeed in strategy and tactics; but I am sure that I am not wrong in stating that too many officers tacitly assume that this knowledge will come to them as a result of a faithful discharge of their duties as they advance in years and grade towards positions of command and responsibility.

So far is this from the truth that no apology seems necessary for any length of illustration that may be required to show its fallacy, and its extreme danger.

I am going to attempt to explain this by using as an illustration the method of training employed in a game with which you are all very familiar, namely, football. This game does not cover a sufficiently extensive field to serve as a complete illustration of the strategical and tactical difficulties involved in handling a great fleet; but it will, I believe, serve well enough to make clear the distinction between the two essential elements of success; that is, first, the strength, equipment and training of the individual units and, second, the training of the guiding and coordinating minds.

Let us, therefore, examine the principles and methods of training which have enabled us to attain such a high degree of excel-

lence in playing this strenuous game. If you want to teach your team to play successful football, you set it to work actually playing many games against other strong teams. The players themselves develop by experience new plays and devise methods of counteracting the plays of the opposing team. This they do under the guidance of coaches, who are men who have made a special study of the subject, who are experts in the art of football war.

In playing these games against other college teams, your men are getting ready for a football war that will be declared against West Point in November. These practice games are similar in all essential elements to the "war game" you will play against your friendly rivals of the other branch of our military service.

Your method of training is, therefore, perfect in all respects, simply because you can repeatedly make exactly the same kind of "war" in your practice games that you will make in the great game at the end of the season.

If we could use our great fleet as frequently in actual battle with other fleets, our preparation for a naval war would thus be rendered equally thorough; but of course this could not be done without the loss of many ships and many men. We must, therefore, seek some other method of instructing and training our officers in the art of war.

In order to illustrate the nature of the methods that we are forced to use in training our officers to handle a fleet in war, let us suppose that our football games were as deadly as naval battles. Suppose that a game with West Point, or with any of the other colleges, always resulted in the death of at least five or six players of each side. If that were true, it is evident that you would have to give up your practice games with other colleges and devise some other method of training for the great game with West Point.

Assuming that the public interests required the West Point game to be played, what would you do about it? Manifestly you would get up a kind of practice game that was as nearly like the real thing as you could make it without the risk of actually killing anybody.

In playing such practice games with eleven men on a side, you would be using your brains to get up new plays and your bodies to carry them out, as far as you could do without causing any deaths. In every such game you would be training your minds

in anticipating the probable strategy of the enemy and in making rapid decisions to resist his attacks as soon as they developed.

Our method of training officers to handle a great naval force with the highest possible efficiency in battle is necessarily very similar to that which would be required for training a team to play football if the latter game were as deadly as a naval action. The captain of such a team corresponds to the commander-in-chief, and the players correspond to the individual ships and their commanders.

The football player consists of a body of flesh and a brain. The fleet unit consists of a body of steel, and a brain—the captain. Both are essential to success.

The real business of the navy is preparation for war. All of its training must have that end in view. If war should unfortunately be forced upon us, it must find the fleet prepared in every particular. Such preparation comprises many different elements. We build our ships as strong, as swift and of as great gun power as possible, and we train their crews to the maximum practicable degree of efficiency.

We train ourselves to maneuver the ships accurately and to shoot the guns with the greatest possible precision. Similarly the men of the football team are trained until each is as capable as we can make him.

Now, suppose we assume a group of perfectly efficient battle-ships and a squad of big, strong, athletic midshipmen, and see what we should have to do to obtain an efficient fleet and an efficient football team. Let us take 22 ships and 22 midshipmen and assume that both ships and middies have been trained individually, but that they have never practiced maneuvering together, or playing any game together. Divide the midshipmen into two teams of eleven each, and what success would they have in playing a game of football? Needless to say, there would be no team work, no combination plays, and in place of intelligent direction of the whole there would be collisions and general confusion. They could probably be outmaneuvered and beaten by a good high school team.

If ships that have never been trained together as a fleet were to fight a battle, they would have a similar experience; neither the men nor the ships can do much

1. Until they have mastered the theory and all the practical fine points of the game.

2. Until they have practiced working together until they can act as a single body—as a real team—in applying all these fine points.

But there is still another element of success, the most important of all, and that is the man whose brain directs the whole action. The football team must have an efficient captain and the fleet must have an efficient commander-in-chief. These are the men who train their respective teams to act as a single body. They must not only have complete knowledge of the strategy and tactics of the game, but they must train their individual units to understand and apply them. They must develop new plays and devise the signals that indicate them; and they must have rapidity of decision, inflexible determination of character and plenty of nerve to carry out their plans of operation.

All of these really military qualities are wholly essential to success. For example, a man may, in the solitude of his study acquire at least a complete mastery of the theory and principles of football, or of the strategical and tactical principles governing naval warfare. This is knowledge, but indispensable as it undoubtedly is as a guide, and valuable as it may be in preparing the mind leisurely to reach a correct understanding of the significance of any situation that may arise, it is not an adequate training in the personal qualities that make for success in battle. These qualities are moral and mental ones. They comprise the ability to recognize, not leisurely, but promptly, the military significance of each strategical and tactical situation; ability to withstand surprise without impairment or suspension of judgment; rapidity of decision and promptness of action; and inflexible determination in carrying out the plan of operations.

These indispensable qualities of mind and military character can be acquired in no other way than by constant and intense competitive practice—constant and intense training of the mind and the will through handling the various types of situations in competition with alert minds that are handling the forces on the other side. We all recognize the importance of complete theoretical knowledge of the principles of any subject, and the importance of a complete mastery of all the practical details involved; but it may be doubted whether we all fully realize the no less imperative necessity of actually training our minds to apply the principles of naval warfare with that confidence, rapidity, and

determination without which success is not possible in conflict with a well-trained enemy.

This subject of mental training through constant mental practice is of such importance that, even at the risk of tediousness, I will attempt still another illustration, also based upon the game of football.

Suppose a thoughtful and studious midshipman should come forward with a team of eleven men and base a claim to the honor of defending the academy against West Point upon the following grounds:

My team is composed of the eleven best athletes in the academy. I have trained them physically until they are each of them stronger and faster and have more endurance than any other men on any other team in the country. They can kick a ball straighter and farther than any others, and they can tackle harder. We have not paid any attention to any of the books or articles written by the masters of the game, nor have we received any instructions from these experts. We have practiced a bit with the ball on the field, but we have never played a real or a make-believe game against another team; but as we are individually stronger men, swifter men, longer kickers and harder tacklers than any others in the country, we believe we can win.

It needs no argument to show that such a team could not win if pitted against another team all of whose members had been thoroughly drilled in team work under competent coaches, and thoroughly trained in many actual games against other strong teams. The eleven individually trained men could not win because a well-trained team, even though composed of weaker men, would have the enormous advantage of the ability to act as a whole, without confusion and with confidence and precision, under the leadership of a captain whose mind has been trained, in actual conflict with other minds, to accuracy of judgment, readiness of resource, and promptness in action.

Applying the above illustration to our naval service will, I believe, show not only a marked resemblance in conditions between the navy and the untrained team of eleven strong men, but will indicate very clearly the nature of the means necessary to render the navy efficient.

Analyzing the principal elements of success in football and in naval warfare, we find the following striking similarity.

There are three primary elements that are essential to success in football, namely: Efficient material, adequate knowledge of

the game, and adequate mental training in applying this knowledge.

1. Efficient material requires individual team members who are physically well developed and well trained, strong, swift, hardy men who can buck the line hard, kick hard, and take punishment.

2. Adequate knowledge of football—a mastery of the theory of the strategy, tactics and practical details of the game.

3. Adequate mental training—a leader and men whose minds have been trained by constant team practice to apply their knowledge and strength with the utmost rapidity and mutual confidence, and to take instant advantage of any situation that arises.

There are also three primary elements that are essential to the success in war of a nation's fleet, namely, the same elements—efficient material, adequate knowledge, and adequate mental training:

1. Efficient material requires fleet units individually well trained, ably commanded, powerful, swift, and able to give and take hard knocks.

2. Adequate knowledge—leaders and commanders who have a thorough knowledge of the art of war.

3. Adequate mental training—a leader and commanders whose minds have been trained by constant team practice to apply their knowledge with the utmost rapidity and mutual confidence, and to take instant advantage of any situation that arises.

As previously explained, you can and do develop to the highest degree all the three elements of success in football by your present methods of training. You have the husky men, you know the game, and you can develop your ability to play the game by practicing it as much as you wish under exactly the same conditions as those that will pertain in your final games.

Contrasting these facilities for developing football with our facilities for developing naval efficiency, we find the following unfavorable comparison. We have the ships, strong and well trained individually. But very few of our officers have received any instruction in the art of war, and an insignificant minority has received adequate instruction. Very few officers have received any competitive training in applying the principles of naval warfare, and almost none have received adequate training.

Our navy, therefore, corresponds at present very nearly to the eleven candidates for football honors who are strong, who are

swift, who can kick, but who have not studied the strategy and tactics of the game, and who have never played it, or even seen it played.

The question is, what are we going to do about it? We are rapidly perfecting our material. We are now building ships that we believe are at least equal in power to any afloat. Our discipline and ship training are good, and we feel sure that we are second to none in hits per gun per minute at the longest practicable ranges; but we, the officers of the service, know little about war, and we are not training our minds to use efficiently even the little we do know.

Manifestly, our requirements are to educate our officers in the art of naval fighting, and to train their minds to apply their knowledge with maximum of efficiency.

How are we going to do it? Obviously, we cannot acquire the necessary knowledge and training by actually fighting our fleet against another. We cannot acquire much of it by service in the fleet. We must perfect an organization that will provide our officers with the necessary education in war, and devise games that will train their minds in applying this knowledge.

For more than 25 years we have had, in the Naval War College, the necessary facilities for providing this knowledge and training; but, unfortunately, the importance of its function has been so little understood that the plant has been throughout many years practically idle, through lack of the raw material—student officers. Admiral Luce, aided from time to time by a few other farseeing officers, after years of agitation, succeeded in having the college established, but upon several occasions they were forced to exert their maximum influence to prevent its abolition. At times it was doubtful whether they could retain even the building. Sometimes there were two members on the staff, sometimes half a dozen. Short summer conferences were held which served, as Admiral Luce states, to acquaint officers with the terminology of the art of war and show them how much they had to learn; but not until 1911, when the long course was created, and the essential applicatory system of training thoroughly established, under the presidency of Captain William L. Rodgers, were any regular students sent to the college. It was the only institution of learning in the world that had a building and a faculty, but no students.

Of course there was a reason for the Department's action. The various secretaries have usually acted in such matters upon the advice of naval officers—advice which was, of course, based upon honest convictions. It is important, therefore, to examine the nature of these convictions for there can be no doubt that they still exist, though doubtless in less degree.

This state of affairs is the result of the too prevalent opinion in the service that the college necessarily devotes its attention to "High-Brow Theoretical" studies, and that these are of little more than academic interest or importance in comparison with practical experience and the sea habit. Stated in its usual form, this singular conviction is that "theoretical" knowledge does not help you much in acquiring proficiency in practical work; that the best possible preparation for the duties of any grade is practical proficiency in the grade immediately below it; and the conclusion of the so-called "practical man" is that War College work, as he understands it, is mainly in the line of what might be called "naval culture"; that while it may be interesting to the man who has a taste for that sort of thing, and a ready pen to expose his theoretical reflections, it cannot be of much use to the real salty naval officer.

Well, if I cannot succeed in dispelling this illusion, I shall have wasted my time and yours. Let us, therefore, examine the conviction of the "practical man" and see if we cannot discover the basis of his point of view. I know what his point of view is, for I have heard it explained by many officers who honestly believed they were becoming qualified for higher command; but I have also in many cases seen it gradually abandoned by officers as soon as they became acquainted at the college with the very *raison d'être* of that institution.

The "practical man's" conclusion is correct up to a certain point. It is true that the efficient performance of duty in each of the grades below command rank is an excellent preparation for the duties of the next higher grade; and it is equally true that the War College will not supply him with much information that will be useful to him in performing these duties; but where the "practical man" goes astray is in his almost inevitable assumption that this applies equally to all grades.

The reason that the assumption in question is usually applied to all grades, including the higher ones, is doubtless because it

is true as regards the great majority of the grades—that is, the junior grades. The peace duties of junior officers—gun-division officers, navigators, first lieutenants, engineer officers, gunnery officers, and executives are most excellent training for the principal duties they will have to perform in time of war.

But, and this is the gist of the whole matter, the assumption is true only to a very limited extent as regards officers who exercise command of ships, divisions, squadrons, fleets, or any other separate detachments.

It is distinctly untrue that the duties that these higher officers perform in time of peace are anything like an adequate training for the duties they will have to perform in time of war.

Moreover it should be especially noted that it is, and always will be, physically impossible to obtain such training by service in the fleet, no matter how extended it may be. This impracticability is due to the simple fact that it is not possible actually to use great fleets to play a sufficient number of war games to provide its officers with adequate mental training in strategy and tactics.

Let me state a concrete case. Assume that we have, mobilized at Hampton Roads, a fleet consisting of:

35 battleships	100 colliers
10 armored cruisers	4 advanced base ships
30 scouting vessels	6 troop ships
12 gunboats	30 torpedo boats
50 destroyers	40 submarines
20 auxiliaries	—
	337 vessels

A European nation has declared war for the purpose of acquiring a naval base in the Caribbean, and has just despatched an even more powerful fleet.

How, in the exercise of command in time of peace, could the commander-in-chief and his subordinate admirals and detachment commanders have acquired the knowledge of war and the mental training necessary to enable them to draw up and carry out efficient strategical plans of operation, to organize the force in the manner that would most efficiently meet the requirements of the situation, and to handle it with success in actual battle?

The process required to accomplish this is chiefly a mental one. Previous experience in ordinary fleet service will be of little use. A knowledge of the principles of warfare derived from a study

of the great masters will be indispensable; but this knowledge can be successfully applied only by minds that have been trained by much practice in the solution of just such problems, and in the formulation of orders that will insure the commander's intentions being carried out in complete coordination with his plans.

Manifestly, the fleet cannot be used as a means of acquiring this essential mental training except to a very limited extent in the practice of minor problems; but even such practice will not supply the knowledge of the principles that are to be derived only from the history of warfare; and without adequate acquaintance with these principles even the most extensive practice of minor problems cannot do much more than train the mind in the application of such knowledge as is already possessed.

Again, we may ask, what are we going to do about it? We would go down under a storm or ridicule if we attempted to beat West Point with eleven superb athletes who did not understand, and who never had practiced, the game.

What sort of a storm do you think it would produce if we should attempt to hold the Caribbean or defend the Panama Canal with a fleet of superb dreadnoughts commanded by men who did not understand the game and who had never seen it played, even in miniature? The result would doubtless be a disaster, so complete that the country would not recover its prestige in fifty years, though it might rebuild its fleet.

I do not wish to be understood as implying that all our officers are ignorant of the art of war and untrained in the application of its principles; but it must be perfectly apparent to any one acquainted with the facts that, barring a wholly insignificant proportion, the commissioned personnel of the navy is not now being systematically and adequately educated for the performance of its higher duties in time of war.

It is evident that this essential education must be provided for. There remains only the question as to the most efficient method; and since it is materially impossible to carry out with the mobilized fleet exercises that are sufficiently extensive and sufficiently numerous to provide the necessary training, it is equally evident that we must devise some form of game which will require, in order to win, the same knowledge of the art of war, and the same exercise of the mind in applying this knowledge, as would be required in actual war.

It must be a game that can be played hundreds of times, or often enough to enable the student to correct at least all fundamental mistakes—which is a requirement that is essential to any adequate mental training.

A commander-in-chief and his subordinate commanders who have been trained in such a manner will be prepared to meet the probable strategy of the enemy. The training itself will have developed a doctrine of war so fixed as regards its fundamental rules and principles that when an order is given it will be understood and obeyed in the light of this common doctrine.

I know from experience that the omnipresent "practical man" often regards such games as too theoretical to be of benefit to him. Let us, therefore, examine the point in sufficient detail to make clear the practical nature of the war training in question.

The college war games—the tactical games and maneuvers—bear the same relation to efficiency in handling a fleet as dotter and subcaliber practice bear to efficiency in handling a ship's battery, or as practice on the field bears to efficiency in handling a football team.

A man practices with the dotter until his mind and muscles are so trained that continuous aim becomes nearly a subconscious process.

Men practice on the football field until their minds are trained instantly to meet and act upon any situation that may be presented. Their method of training is perfect.

Similarly, officers practice the war games until their minds are so trained that decisions flow naturally and almost automatically from the war doctrine developed by the training itself.

We use the dotter because we cannot fire the guns often enough to get the necessary amount of training; and, similarly, we use the war games because we cannot use the fleet often enough to get the necessary amount of training.

You have all seen how the dotter practice develops ignorant and untrained men into expert gun-crews.

You have all seen how the subcaliber practice develops the efficiency of the fire-control party and of the battery as a whole.

You fully realize, I am sure, that these practices, though theoretical in a sense, are in the highest degree practical training. You have doubtless noticed that in all cases the training is a process of making mistakes and correcting them.

You have all seen the husky untrained midshipmen successfully trained by practice until they become alert, quick minded and expert football players. You fully realize that without such mental practice, such a process of making and correcting mistakes, success would be impossible.

Similarly, if you should attend the Naval War College, you would see exactly the same kind of a process being applied to officers. You would see young officers of excellent attainment, as regards all the duties of their grade, commence to play the games in the same mistaken and blundering manner, and, by the process of correcting their mistakes, become relatively expert, attain confidence in the application of their knowledge, ability to give and understand military orders, and promptly to act upon them in coordination with the commander-in-chief. Confidentially, I may say that some of the older officers who attend the college have exactly the same experience.

I think you will recognize, therefore, that these so-called theoretical war games are no less practical as a training of officers in handling a fleet than are the dotter and subcaliber practices in training men and officers in handling a ship's battery.

We may, in fact, regard these games as, in reality, nothing more nor less than dotter and subcaliber appliances that have been devised for training officers in the application of the art of war. In each case we use an inexpensive miniature appliance that supplies the same kind of mental training as the real thing; and we do this simply because we cannot use the real thing for this purpose.

As a matter of fact, the college war games possess the greater practical value, because they serve to develop new applications of the principles of warfare as applied to modern naval conditions. From lectures that will be delivered upon these subjects you will doubtless learn that certain new features of tactics were not derived from individual inspiration or reasoning, but are the direct result of the conflict of many minds striving in tactical games to outmaneuver each other. They will also explain how the tactical game demonstrates the necessity for new or modified types of vessels, or new or modified uses for those already built.

These games are played under rules that are as nearly like actual conditions at sea as our present experience will permit us to formulate. The practicability of rules and certain maneuvers are tested in the fleet and modified accordingly.

Let me here invite your attention to another significant fact concerning these war games, and that is that an admiral who handles a great fleet in war will be obliged to do so in very much the same manner as that in which a paper fleet is handled in the games, and this for the simple reason that it is not physically possible to handle it in any other way.

In the comparison made between an untrained football team and an untrained fleet, I have, for simplicity, purposely assumed a fleet of eleven vessels. This is hardly more than a squadron, to be handled, like a football team, under the immediate eye of its commander. But the man who directs extensive naval operations has a much more complicated task to perform. He may have under his command no less than 140 fighting ships of various classes, not including torpedo boats and submarines and auxiliaries.

As such a fleet, even in massed formation, would cover an area of over 100 square miles, and probably 1000 before the action was over, it is evident that but a small part could be within view from any one position; and that therefore the commander-in-chief would have to be guided by a study of the positions of the various subdivisions as plotted on a chart—which would be exactly the same process that he would employ in war games, with respect to detachments that were beyond the range of vision, or so far away that their maneuvers could be determined only by instrumental measurements. The same process would of course be required in controlling the strategical maneuvers that preceded the tactical engagement.

Thus it will be seen that, in order to play these war games with success, the leaders require the same kind of knowledge and the same kind of mental training as they would require to conduct successful naval operations. They are, therefore, not only highly valuable training, but training of the most practical possible kind.

I hope I have made it clear that these war games are not only eminently practical as a means of acquiring essential mental training, but also that this training cannot be acquired in any other manner whatever; that the really practical men are those who study war and train their minds to conduct it with success; that an officer's whole career should be a preparation for the duties that may devolve upon him in a time of great national danger.

My contention is that we should devote at least as much thought and energy to preparing ourselves to win battles on the sea as we do to preparing our football teams to win games on the gridiron.

And now a word as to the duty of individual officers in this respect.

It need hardly be more than stated that any system of naval organization is fundamentally defective which does not provide for the systematic and adequate education and training of its officers in the art and practice of war; but in the absence, or inadequate operation, of such an organization, much can be accomplished by the individual, and much more by cooperative work, where practicable.

It seems evident that any man who once grasps the real significance of his position as a naval officer; who once realizes that he has signed a contract to do his utmost in defense of the country in time of danger, will begin to prepare himself for the duties that will devolve upon him. And, when he once realizes that he cannot efficiently perform these duties unless he understands war, he will doubtless employ some of his leisure time acquiring that knowledge. If he can do nothing else, he will have accomplished much. His mind will at least be stored with the knowledge that will make it ready to be trained in its correct application.

But if, in addition, he can, in association with those with whom he is serving, get some of the war training herein described; if he can manage to play a few war games, even in a modified form, he will have accomplished a great deal in the way of preparing himself—his mind—for war.

Moreover, he will find that these studies and exercises have given him a new point of view as regards the naval profession. When he once clearly sees that his real mission is to do his part at all times in preparing the navy for war, and in helping others to do the same, we may be sure that even his most irksome routine duties will take on a new significance and be lightened accordingly.

I need hardly say, that, in my opinion, all officers should be given the opportunity, either at the War College, or in War College Extensions, to study the art and practice of war.

In describing the attitude of the "practical man" it is not meant to imply that neither the fleet nor the service in general takes any interest in the work and aims of the college, for such is not the case.

Some subdivisions of the fleet are now doing a certain amount of work in the way of solving strategical and tactical problems similar to those used at the college, and in studying the art of war. In addition, about 550 officers are now taking the correspondence course provided by the college.

There are also so many other evidences of interest in and appreciation of the kind of work the college is now doing that in my opinion it will not be very long before it will be considered absurd, or worse, to assign to any important positions, ashore or afloat, any officer who has not acquired an adequate knowledge of war, either at the college or elsewhere.

When this becomes the general opinion, it will be considered both an honor and a valued privilege for an officer to be allowed to take the course at the college. In some foreign naval war colleges only those officers are admitted as students who win the privilege in severe competitive examinations; and only graduates of the colleges can be assigned to duty on the staff of a commander-in-chief afloat.

These are very desirable conditions which I feel sure we are fast approaching; and if this is true it behooves all officers who have a just regard for their future careers to prepare themselves successfully to meet these conditions.

With this end in view it is evident that the earlier officers begin the studies in question, and the more they are able to accomplish in the way of acquisition and mental training, the better it will be for them and for the service.

As even indifferent students know, a very little time devoted to a subject each day will result in really astonishing accumulation. Where a number of officers are serving in the same locality, as in the subdivisions of the fleet, in Washington, at naval stations, in the wardrooms of ships, etc., cooperation is facilitated, and results can be accomplished which cannot be achieved by officers working independently.

If, therefore, I have been able to present this case, of the long neglected training of our officers for war, with sufficient clearness to show its imperative necessity, perhaps some may be inspired to take the first steps toward the establishment of what may be called Naval War College Extensions.

If so, I am sure that both the college and the Department would gladly meet them half way, by affording the necessary facilities

and supplying the necessary preliminary instructions. Certain lectures, supplemented by the experience of those of you who have attended the college, would serve to initiate the playing of the strategical and tactical games, and would, beyond question, demonstrate their great practical value much more convincingly than I have been able to do.

In addition to this, if officers should find the time to take up a selected but limited course of military reading, there can be no doubt that in a year's time they would have every reason to congratulate themselves.

The following list of books is suggested as preliminary to a more extended course of reading when opportunity offers. Many similar lists could be suggested, but it is believed that these books will prove not only as interesting as any, but will serve to give a general idea of the nature and extent of the knowledge that is essential to success in war. It is assumed that officers are familiar with the earlier works of Mahan, and with those of Daveluy and Darrieus that have been translated and published in the Naval Institute:

The Brain of the Navy.....	Wilkinson
Naval Strategy	Mahan
Maritime Strategy	Corbett
Letters on Strategy	Hoenlohe-Ingelfingen
Modern War	Derrecagaix
On War	Clausewitz

A list of the principal works used in the various branches of study at the Naval War College will be sent upon application.

And now, in conclusion, let me point out that the training I have suggested will not impose upon you a task in the ordinary acceptance of the term. It is, on the contrary, a game that is proposed for your entertainment and instruction. It is as thoroughly competitive as football or chess or any other game that involves the conflict of mind against mind; but in addition to the natural interest inherent in all competitive games this particular one is so intimately associated with that which, in playing it, you will soon recognize as one of the most essential elements of maritime power, that it cannot fail to interest you intensely; therefore I can promise you with every confidence that even the limited course of reading and war games herein indicated will prove a revelation. It will not only give you a new point of view; will not only define your real mission in life; will not only lead you to regard

the service in a new and higher light, but will actually transform the daily grind of routine duties in peace into a willing and cheerful service in the cause of preparation for war.

If I have succeeded in convincing you of the importance of an officer keeping his mission always clearly in mind; if you believe that this will cause his ordinary duties in time of peace to assume such a new aspect that his efficiency in all grades will thereby be increased; if you believe that this attitude toward the service will naturally incline a young officer's mind toward the study of the ultimate object of his profession—that is, success when war overtakes us—it follows that every officer should have these ideas thoroughly implanted in his mind, and should pass this instruction along.

I do not advocate the instruction and training of midshipmen in the art of war, but I do advocate very strongly their being given clearly to understand what they are here for, what they are in the navy for, what the meaning of their contract is, otherwise they are more than likely to waste the priceless years during which only habits of study can be formed and knowledge easily acquired.

In this connection, let me briefly relate, as an illustration, my personal experience. Upon leaving the academy in 1880, I had no real conception of my proper relation to the service, and cannot even recall what my attitude was. Probably I had never formulated any. Doubtless for a long time I was not only comparatively useless but perhaps actually detrimental to efficiency.

There was little doing in the navy in those days of old wooden ships and cast-iron smooth-bores. Officers used to return from shore in the 9 o'clock boat and go ashore again in the 10.30. An afternoon drill period would at that time have brought on a mutiny of serious proportions. There was relatively a great deal of leisure. Under these conditions I put in perhaps 12 or 15 years in a variety of reading that had no direct relation to the profession, including the philosophies, political economy, etc. This was of course useful, but certainly not in the line of an officer's mission.

If some officer of experience had explained this matter to my class, if he had accentuated the importance of military studies (and he could have done it in an hour), I am sure we all would not only have performed our duties more efficiently in all grades

but we should, through a gradual accumulation of knowledge, be much better equipped than we are at present.

And, now, a final word to correct a possibly erroneous inference that you may have drawn from what has been said concerning the importance of the training to be obtained at the War College.

I do not wish to convey the impression that it is my opinion, or that of anybody who has attended the college, that the course of 12 months does or can ever provide either adequate knowledge or adequate training. It cannot possibly do so. The most it can do for the untrained man is to give him the uninterrupted opportunity to acquire the basic principles of the art of war and a certain amount of mental training in their application.

Its principal value is in showing such a man how much he did not know when he began, how much he yet has to learn, and what should be the direction and objective of his future studies.

Unfortunately, as applied to an old man, the future is short—the end of the career is close aboard; but how different it might have been if this old man had been pointed fair in his youth; had been given clearly to understand that only through the gradual, thoughtful accumulation of information, throughout a long period of years, can a reasonable mastery of any subject be attained?

Specifically addressing the younger officers of the navy, let me say that you now have the opportunity that can never return. It lies with you to determine whether, when you become old, you will have to regret the wasted years of your youth; whether at that period of life you will find yourselves simply “practical men”—“beefeaters”—or really educated military naval officers.

It will depend largely upon self-instruction and self-discipline. But you must keep clearly in view the fact that, under modern naval conditions, an officer may be highly successful, and even brilliant, in all grades up to the responsible positions of high command, and then find his mind almost wholly unprepared to perform its vitally important functions in time of war.

The appeal to an officer's patriotism and loyalty is of course higher than an appeal to his personal interest, but when the circumstances are such that the pursuit of personal ambition tends in all respects in the direction of efficiency in preparing the navy for war, then it is to be commended and encouraged.

I have tried to make it clear that those of you who do not acquire a knowledge of the art of war and who do not train your-

selves in its application, cannot reasonably hope to be selected for distinguished duties in the higher grades. Also that every officer who prepares himself for such duties is thereby increasing the efficiency of the navy as a fighting organization.

If my career were ahead instead of behind me, I should endeavor to the extent of my ability, and at the earliest opportunity, to acquire as thorough a knowledge of the principles of the art of war as possible, and should neglect no opportunity to train myself in their application by playing competitive war games.

Such training cannot be begun too soon after an officer has acquired a certain amount of experience in the service, and I should consider it commendable in him to use all proper means to obtain orders to the War College.

He is indeed blind to the signs of the times who does not see that new standards of efficiency are rapidly forming in the service; and those who, understanding this, still neglect the opportunity of youth, with its mental flexibility and freedom from responsibility, will have themselves to blame if, when they reach the higher grades, they are not promoted and are relegated to the class of hewers of wood and drawers of water.

In conclusion, let me again state that in inflicting these elementary principles and illustrations upon such experienced officers as compose this class, I have had in mind chiefly their possible influence upon the large number of admirable young officers who are coming up to take their places; for, manifestly, if a knowledge of the art of war cannot eventually be extended to the fleet and the service at large, the college will have failed to accomplish an important part of its mission.

In welcoming you to the college, I feel that you are to be congratulated upon having an opportunity to devote to these important professional studies a whole year quite uninterrupted by other professional duties or responsibilities.

You may be sure that it shall be my object and that of the members of the staff to facilitate your work in every way, and to render your stay as agreeable as possible.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AN INTRODUCTION TO THE USE OF NOMOGRAMS OR ALIGNMENT CHARTS

By COMMANDER G. L. SCHUYLER, U. S. Navy

1. One is often struck by the fact that nomograms or alignment charts are coming more and more into general use in engineering subjects. In England they are frequently used in gunnery work. In France they are particularly popular. In the U. S. Naval Service we are beginning to see them. Usually, since they are so simple to work and since they are presented without explanation of their theory, those who use them do not learn the theory of their construction. One may not know where to turn to to study up the matter and may hesitate to show apparent ignorance by inquiring. Since occasionally one might want to make an alignment chart of his own for some special use, it is thought that an elementary discussion of the simplest good all-around form of alignment chart may not be out of place. It is hoped that they will in time be more commonly used in our naval service.

2. After looking over various books in which the subject is treated, we have here put it briefly in the way which seems clearest to us. "Graphical and Mechanical Computation" by Lipka, John Wiley & Sons, is suggested as very suitable for reading by naval officers who may be interested in going beyond this elementary discussion.

3. Suppose we want to multiply two variables x and y to get a product z . The slide rule uses logarithmic scales and affords a ready solution. But consider also the following alignment chart construction (Fig. 1):

At equidistant points a , c and b on the horizontal base line, erect perpendiculars and lay off on the perpendiculars from a and b scales running simply as logarithm x and as logarithm y . Then if using a straight-edge we connect any point on the x scale as h with

a point on the y scale as d , where will the straight-edge cross the z scale? Obviously at a point f , which is the mean height of ah and bd . In other words, cf would be

$$\frac{ah+bd}{2} \text{ or } \frac{\log x + \log y}{2}$$

If we graduate the scale of z on cb as *half* of the ordinary logarithms, z will be read off as the product of x and y , for $\log z = \log x$

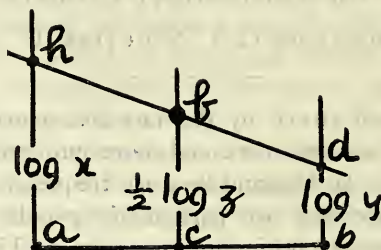


FIG. 1.

$+\log y$, and, by marking off the z scale as one-half of the logarithms of z , we get around the fact that the mean is only half of the sum.

4. Now suppose we had wanted to get not $z=xy$, but $z=x^2y$. Then $\log z = 2 \log x + \log y$. We want then, in summing up the x

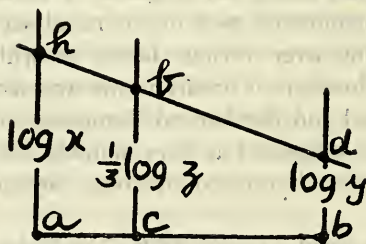


FIG. 2.

and y logarithms, to give double weight to $\log x$. We can do this by making the point c twice as close to a at the foot of the $\log x$ scale as it is to b at the foot of the $\log y$ scale (Fig. 2):

Then $cf = \frac{2ah+bd}{3}$ or $\frac{1}{3}(\log x^2y)$; so this time we must graduate the scale for z as $\frac{1}{3}$ of the logarithms of z .

5. So with simple logarithmic scales for x and y , *i. e.*, with both drawn natural size, we must have the ratio $\frac{ac}{cb}$ the same as the desired ratio of the exponents of x and y :

($\frac{1}{2}$ for xy , $\frac{1}{3}$ for x^2y , $\frac{1}{4}$ for x^3y , and $\frac{1}{5}$ for x^4y , etc.)

6. But in going from simple products to products involving powers of x and y , there is an alternative method. Instead of sliding c over twice as close to the x scale to give logarithm x twice the weight in the sum; we may get this same effect by leaving c still in the middle of ab , but making the x scale twice as large as formerly, or as $2 \log x$. In this case (Fig. 3) $cf = \frac{2 \log x + \log y}{2}$

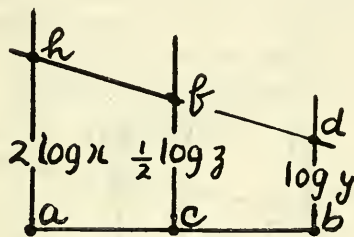


FIG. 3.

and we have then only to graduate the z scale as half the logarithms of z to make this sort of alignment chart work.

7. The foregoing is not a proof but is just a preliminary glance over the matter to illustrate the nature of the nomograms so as to have an understanding of them in mind while proving the constructions for the more general forms like $kx^ly^mz^n$, etc.

8. Such alignment charts as these are really only logarithmic scales summed up graphically with the weights of the exponents of the variables or, what is the same thing, with the values of the coefficients of the logarithms in the sum of the logarithms, taken care of by either of the following methods:

- (1) A shifting of the position of the intermediate scale z , or
- (2) An increase in the size of units used in plotting the logarithmic scales of one or both of the variables x and y .

Or, we may use both (1) and (2) at the same time, especially if it is desirable to make the scales of more convenient lengths. If, for instance, x has only half the range of y , it would be better to use the method of Fig. 3 and plot the logarithm x scale double size

rather than to leave its scale of inconveniently short length while merely shifting the z scale closer to it (as in Fig. 2). Convenience of scale length is a governing factor and one can suit himself.

9. Now about any constants in the formula. It seems that since we are dealing with logarithmic scales, everything we have said still holds even if constants come into the formula. For a bodily vertical displacement of the logarithmic z scale will take care of all the constants connected with z . We will find that we can lay off the x and y scales so that the extreme values are at the top and at the bottom (with each scale 10 inches long); next carefully locate where the z scale comes between the other scales. Then we need construct only one point on the z scale to get the proper origin for the scale of z . With this and with a knowledge of how far apart the graduations on the logarithmic z scale should be spaced, the graduations of the z scale can be put in place.

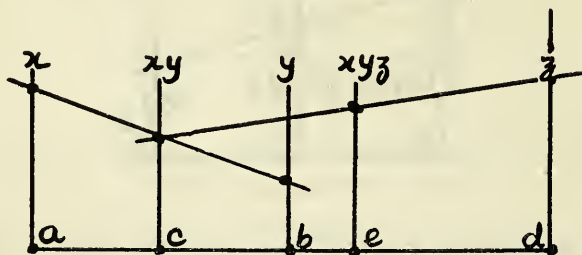


FIG. 4.

10. If one wishes to make an alignment chart for three factors he can first make one for two factors (scales a, c, b in Fig. 4):

The point P on the c scale (often called the "support") gives the product of the first two. Then this is considered as the start of another similar nomogram, the scale at d carrying the next factor z . The product of xyz is read off of scale e . And one can extend this process to any desired number of factors. Support scales need not be graduated as the partial products shown on them are not needed in the work.

11. By adjusting the horizontal intervals between the scales and by adjusting the size of the logarithmic graduations on the scales, x, y and z can be given any desired exponents and the scales themselves can be made any desired length (10 inches for all is a good value). We can have division alignment charts as well as multiplication alignment charts, for if in Fig. 1, where $z = xy$, we reletter interchanging y and z , we have $z = \frac{y}{x}$. Or we can lay a

logarithmic scale off the other way, *i. e.*, from top to bottom, to take care of a negative exponent. In fact one can handle any expression like $Kx^l y^m z^n$, etc., where the exponents are fractional or negative, or anything he likes to make them, and where the number of factors like xyz is as great as one pleases.

12. There are literally hundreds of different forms of alignment charts. But when studied, this particular form proves to be of extreme generality. It has therefore been selected as the illustration with which one can best introduce the subject to those unfamiliar with alignment charts and their construction.

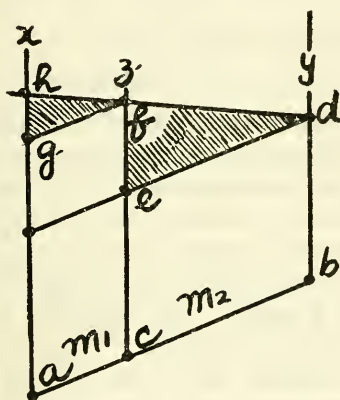


FIG. 5.

13. If we have three parallel axes as ah , bd and cf (Fig. 5) carrying scales for x , y and z , it is of great interest to know how the lengths of the intercepts are related in terms of the spacing ratio $\frac{m_1}{m_2}$ between these axes. For with this knowledge we can give what relative weight we desire to the other scales in reading off a weighted sum of the x and y logarithms on the z scale between them. We can get the idea from rereading paragraph 4, but, to show it more generally, we have, in Fig. 5, made acb a transversal instead of a horizontal base line. We will be interested to find how this proof shows the different scales can without complications be moved up or down to get them opposite each other for convenience.

14. If we make de and fg parallel to acb , the triangles fgh and def are similar. Then the ratio

$$\frac{hg}{fe} = \frac{hf}{fd} = \frac{ac}{cb}. \quad (1)$$

And we can call the ratio $\frac{ac}{cb} = \frac{m_1}{m_2}$ and consider this the spacing ratio into which the z scale divides the interval between the x and y scales.

15. From (1)

$$\frac{m_1}{m_2} = \frac{hg}{ef} = \frac{ah - ga}{cf - ec} = \frac{ah - fc}{cf - db}. \quad (2)$$

Therefore, $m_1cf - m_1db = m_2ah - m_2cf$, or

$$(m_1 + m_2)cf = m_2ah + m_1db. \quad (3)$$

So if we plot logarithms their normal size in both scales in this way, then in getting a sort of weighted mean on the z scale we find we have given a relative weight to each logarithm proportional to the interval between the z scale and the scale of the other variable. (In Fig. 2, for instance, a weight of 2 was given to $\log x$ by making the interval between the z and y scales twice the interval between the z and x scales.) We will have weighted the logarithms inversely as the spacing ratio.

16. In general, however, one would not plot $\log x$ and $\log y$ normal size, but would expand or contract to make them fill up the desired lengths. Then one can select the spacing ratio $\frac{m_1}{m_2}$ for locating the z scale in such a way as to take care not only of the scale enlargements used, but to take care, at the same time, of the exponents desired for x and y . To get at this sort of construction we may first place equation (3) in proper form for direct addition of scales by dividing through by m_1m_2 to get the following:

$$\frac{\frac{fc}{m_1m_2}}{m_1 + m_2} = \frac{ah}{m_2} + \frac{db}{m_2}. \quad (4)$$

Then the intercept on fc (the z scale) will represent the sum of the intercepts ah (on the x scale) and db (on the y scale), provided we select, on the appropriate scales, moduli proportional to these denominators in (4). If this is done, everything is kept

clear and we will be virtually adding the logarithms of whatever powers of x and y we select and getting direct answers in the product.

17. So, therefore, after plotting $\log x$ on the x scale to some convenient size which will make the scale the desired length, we examine to see how many times we have enlarged the logarithm of the function of x to increase it so as to give the scale actually laid off. We call this modulus m_1 . For instance, if we wanted to have $(x)^{\frac{1}{3}}$ appear in the product and have multiplied $\log x$ by 5 to get a convenient 10-inch length for the x scale, then m_1 is 15. Similarly one obtains m_2 . Then m_3 the modulus for the z scale has to be $\frac{m_1 m_2}{m_1 + m_2}$. This defines the amount of enlargement of $\log z$ on the z scale. The position of the origin of the z scale depends upon the constants. So if we construct one point and calculate the origin of the z scale graduations, the positions of the divisions on the z scale are completely defined. Also ac is $\frac{abm_1}{m_1 + m_2}$ and cb is $\frac{abm_2}{m_1 + m_2}$, so the position of the z scale, as well as the size and location of the divisions on it, is now determined.

18. This is all there is to the construction of such alignment charts but, as in navigation, it is best to develop the ability to apply the theory by including after the explanation an illustrative practical example.

19. *Example.*—

$$w = 472(x)^{.42} (y)^{1.25} (z)^{.75}, \quad (5)$$

and let us say x varies from 1 to 8, y from 30 to 40 and z from 100 to 3500. First it will be determined what multipliers are needed for the logarithms to give 10-inch scales:

	Maximum	Maximum	Log max.	Log min.	Difference	Multiplier for logs to give a 10" scale
x	8	1	.903	.000	.903	11.1
y	40	30	1.602	1.477	.125	80.0
z	3500	100	3.544	2.000	1.544	6.5

This can be done with sufficient accuracy on the onnimeter or on the slide rule. It will be seen that if we had used the same multiplier for $\log x$, $\log y$ and $\log z$, we would not have efficiently

utilized the full available length of all the scales. It is not necessary to insist upon all scales being precisely 10 inches long (or any other exact length for that matter). 11, 80 and 6 are sufficiently accurate and are the more convenient multipliers which will be used.

20. Sometimes specially printed logarithmic paper scales are used for putting the graduations in place. These, by folding, can be made to show logarithms in any degree of enlargement, but they are not quite so practicable as they sound. Also they are not necessary and it will be assumed that the reader has none but will use computation instead.

21. There should be, say, 20 divisions calculated on each scale. For each variable the logarithms of about that number of equidistant values are picked out and the work carried through in the manner shown by the following skeletonized tables. In the third table it is desirable to insert a certain number of extra values in the part of the scale where the spacing is inconveniently large. The fourth column is obtained by subtracting the initial value in the third column from each of the other figures in that column.

TABLE I (x scale)

x	$\text{Log } x$	$11 \log x$	$11 \log x - 0$
1.00	.00000	.00000	.00
1.25	.09691	1.06601	1.07
1.75	.17609	1.93699	1.94
....
....
7.50	.87506	9.62566	9.63
7.75	.88930	9.78230	9.78
8.00	.90309	9.93399	9.93

TABLE II (y scale)

y	$\text{Log } y$	$80 \log y$	$80 \log y - 118.16960$
30.0	1.47712	118.16960	.00
30.5	1.48430	118.74400	.57
31.0	1.49136	119.30880	1.14
....
....
39.0	1.59106	127.28480	9.12
39.5	1.59660	127.72800	9.56
40.0	1.60206	128.16480	10.00

TABLE III (z scale)

z	$\text{Log } z$	$6 \log z$	$6 \log z - 12$
100	2.00000	12.00000	.00
150	2.17609	13.05654	1.06
200	2.30103	13.80618	1.81
250	2.39794	14.38764	2.39
300	2.47712	14.86272	2.86
400	2.60206	15.61236	3.61
500	2.69897	16.19382	4.19
700	2.84510	17.07060	5.07
...
...
3100	3.49136	20.94816	8.95
3300	3.51851	21.11106	9.11
3500	3.54407	21.26442	9.26

22. The computation of the moduli for the scales is as follows:

$$11 \log x = 26.2 \log (x)^{.42} \quad m_1 = 26.2,$$

$$80 \log y = 64.0 \log (y)^{1.25} \quad m_2 = 64.0;$$

so for the support scale

$$\frac{m_1 m_2}{m_1 + m_2} \quad m_3 = 18.51,$$

$$6 \log z = 8 \log (z)^{.75} \quad m_4 = 8.00;$$

and for the w scale

$$\frac{m_3 m_4}{m_3 + m_4} \quad m_5 = 5.59.$$

23. The next step is to arrange the horizontal spacing of the scales. We will place the x scale on the left, the y scale 7 inches and the z scale 8 inches over to the right. This sort of wide spacing of the y scale gives more room between scales in working the alignment chart and makes the straight-edge cut intermediate scales less obliquely. The support scale should be $7 \times \frac{m_1}{m_1 + m_2} = 2.03$ inches to the right of the x scale. The remaining space over to the z scale is 5.97 inches. So the w scale is located $5.97 \times \frac{m_3}{m_3 + m_4} = 4.08$ inches to the right of the support scale, or 6.11 inches from the extreme left.

24. We can therefore lay these out as in Fig. 6. If we calculate the point for the bottom of the w scale ($x=1$, $y=30$, $z=100$) the value of 1, 048, 000 is obtained. Its logarithm, times 5.59 or 33.65370, must therefore be subtracted from $m_5 \log w$ in laying

off the z scale. If we work out the top of the z scale from the maximum values of all the variables ($x=8$, $y=40$, $z=3500$) $w=51,742,500$ is obtained. It should be 9.48 inches up the scale from construction, and this checks with the value obtained by computing it like the other points on the w scale. A tabular form, similar to those of paragraph 21, is used in computing the w scale.

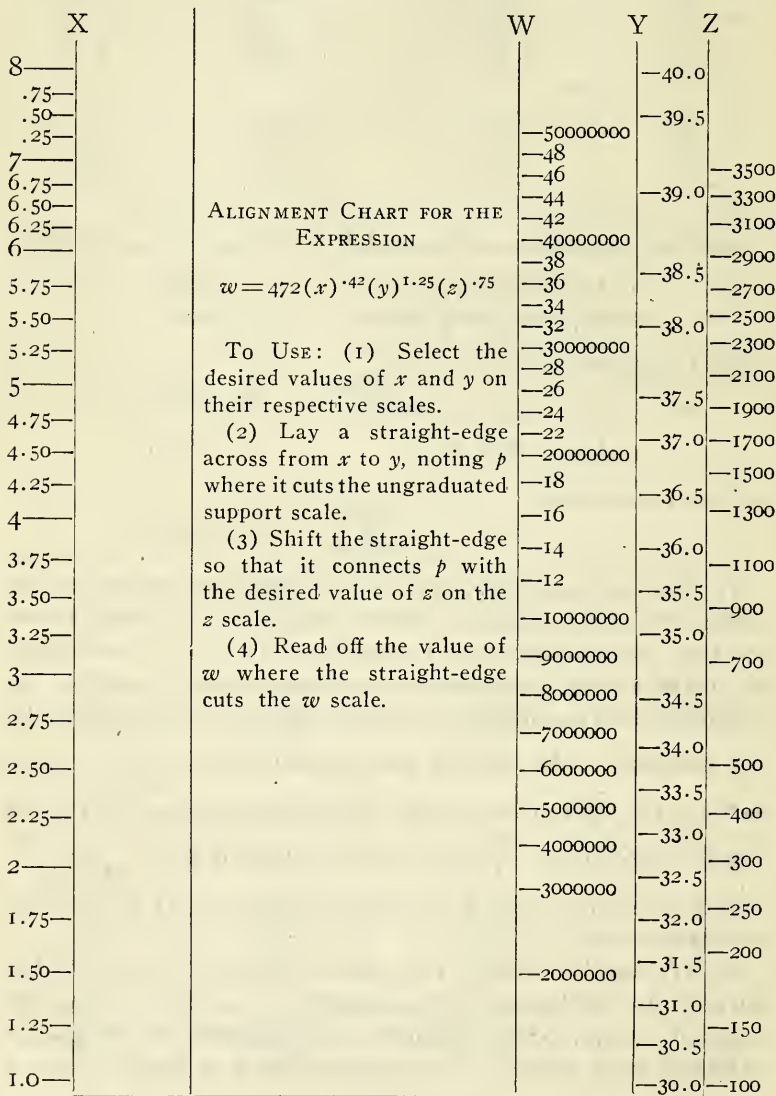


FIG. 6.

25. The alignment chart shown can be defined as follows:

Scale	Distance from left edge	Scale graduations
x	.00	11 $\log x = 0$
y	7.00	80 $\log y = 118.16960$
z	2.03	—
w	8.00	6 $\log z = 12.00000$
	6.11	5.59 $\log w = 33.65370$

26. In using alignment charts the full lines need not be drawn across in the construction, as only short pencil marks where the scales are crossed are necessary. Or else we may use a pin pushed into the paper to mark accurately where the straight-edge crosses a scale. Fig. 6 is necessarily shown reduced in size. Practically any requirements in the way of alignment charts can be readily met by studying Lipka's book or other similar works, but it is thought desirable to confine this article to a description of and an introduction to the subject and to give, though in considerable detail, but a single illustrative example.

NAVIGATION NOTES

By COMMANDER J. F. GREEN, U. S. Navy

ERRATA

On page 75, in the Interval to Noon equation, the signs of the denominator factors representing change in longitude due to speed and that due to current should both be plus. As this affects slightly all subsequent calculations the following solution should be substituted therefor:

$$\text{Interval to noon } \frac{984.35}{900 + 7.5 + .87} = 1.0836$$

$$= 1^h 05^m 01^s$$

$$\text{W. T. } 11 \quad 00 \quad 00$$

$$\text{W. T. of L. A. N. } 12 \quad 05 \quad 01$$

Run from 11 a. m. (by watch) to L. A. N.

Course	Dist.	<i>l</i>	<i>p</i>	<i>D</i>
150°	13	11.3	6.5	8.1

$$\text{Lat. (Nav. Pos.) } 11.00 \text{ a. m. } 37^\circ 05' 54'' \text{ N.}$$

$$l \quad 11' 18'' \text{ S.}$$

$$\text{Lat. (Nav. Pos.) L. A. N. } 36^\circ 54' 36'' \text{ N.}$$

$$L_0 \quad 37^\circ$$

$$\text{Long. (Nav. Pos.) } 11.00 \text{ a. m. } 72^\circ 23' 45.3'' \text{ W.}$$

$$D \quad 08 \quad 06.0'' \text{ E.}$$

$$72^\circ 15' 39.3''$$

$$\text{Current in Long. } 1.084 \times .87 \quad 56.6 \text{ E.}$$

$$\text{Long. (Nav. Pos.) L. A. N. } 72^\circ 14' 42.7'' \text{ W.}$$

Noon constant. True Lat., and Long., at L. A. N.

L. A. T. of L. A. N.	$\begin{smallmatrix} h & m & s \\ 0 & 0 & 0 \end{smallmatrix}$	I. C.	$(-)$	$\begin{smallmatrix} 0 & 01 & 00 \end{smallmatrix}$
Long. (Nav. Pos.) L. A. N.	$\begin{smallmatrix} 4 & 48 & 58.8 \end{smallmatrix}$	T. 46+		$\begin{smallmatrix} 10 & 22 \end{smallmatrix}$
G. A. T. of L. A. N.	$\begin{smallmatrix} 4 & 48 & 58.8 \end{smallmatrix}$	Sub c	$(-)$	$\begin{smallmatrix} 08 \end{smallmatrix}$
Eq. T.	$(-)$	$\begin{smallmatrix} 3 & 48.5 \end{smallmatrix}$	C	$\begin{smallmatrix} 00 & 09 & 14 \end{smallmatrix}$
G. M. T. of L. A. N.	$\begin{smallmatrix} 4 & 45 & 10.3 \end{smallmatrix}$	90+d		$\begin{smallmatrix} 108 & 40 & 12 \end{smallmatrix}$
		K		$\begin{smallmatrix} 108 & 30 & 58 \end{smallmatrix}$
⊙ Dec. +	$\begin{smallmatrix} 18 & 40 & 12 \end{smallmatrix}$	<i>h</i> obs.		$\begin{smallmatrix} 71 & 38 & 00 \end{smallmatrix}$
	$\begin{smallmatrix} 90 \end{smallmatrix}$	Lat. true		$\begin{smallmatrix} 36 & 52 & 58 \text{ N.} \end{smallmatrix}$
90+d	$\begin{smallmatrix} 108 & 40 & 12 \end{smallmatrix}$	Lat. (Nav. Pos.)		$\begin{smallmatrix} 36 & 54 & 36 \text{ N.} \end{smallmatrix}$
App. Lat.	$\begin{smallmatrix} 36 & 54 & 36 \end{smallmatrix}$	Δ Lat.		$\begin{smallmatrix} 1 & 38 \text{ S.} \end{smallmatrix}$
App. Alt.	$\begin{smallmatrix} 71 & 45 & 36 \end{smallmatrix}$			
		Long. (Nav. Pos.)		$\begin{smallmatrix} 72 & 14 & 42.7 \text{ W.} \end{smallmatrix}$
		Δλ for Δ Lat.		$\begin{smallmatrix} 10.9 \text{ W.} \end{smallmatrix}$
		Long. true		$\begin{smallmatrix} 72 & 14 & 53.6 \text{ W.} \end{smallmatrix}$

DISCUSSION

Promotion in the Navy

(SEE PAGE 7, WHOLE No. 215)

COMMANDER R. A. KOCH, U. S. NAVY.—Lieut. Commander Vossler has outlined briefly the three systems of promotion which have been tried in the navy and recommends a fourth as a combination system. Commander Foote states there are only three distinct methods and agrees with Lieut. Commander Vossler. (It is true that any method may be classed in one of these three methods, but there are many methods of application.) Commander Barker states the simple fact that in any scheme a large number of useful officers will be transferred to the retired list or a hump will result and that Lieut. Commander Vossler accepts the hump. (The prevention of the hump has been the reason back of all proposed systems.)

The three systems which have been tried are condemned. The system suggested by Lieut. Commander Vossler is by far the worst system that has yet been suggested as it does not relieve the hump and puts the mass of officers in a position where promotion to higher grades is out of the question, it would tend to kill initiative, energy, mutual confidence, team work, *esprit de corps* and would lower the general average ability.

The Navy Requirements for maximum efficiency are:

- (1) High average ability.
- (2) Promotion to the various grades at a suitable age to get all out of an officer there is in him.
- (3) Selection to duty and assignment in accordance with special qualifications.
- (4) *Esprit de corps*, team work, initiative, mutual confidence.

The navy now has the first requirement. In order to have the second requirement, there must be elimination, which will aid progressively the attainment of the first requirement. The third requirement is now within the power of the navy and is used to a greater or less extent; however, the navy being under-officered, availability must be given too much weight in assignments to duty. The fourth requirement is the most important and can never be obtained by any process of hurdling or re-hurdling, where jealousies must enter and where officers will be tempted, in order to reach higher grades quickly or to prevent themselves from being hurdled by juniors, to use such methods as self-advertisement or to assume all credit for success obtained in any activity, although this success may be obtained in great part by the initiative and efficient work of subordinates. In order for the navy to keep both the second and fourth requirements, it is necessary that officers go up or out. Those who go up will have at

least slightly higher average ability than those who do not and will contain the *stars* required in the various activities, who will by the operation of (3) be in positions such as Chief of Staff or positions without title where their ability is felt, or in minor commands, but they will not function as stars of the first magnitude until they reach the proper age; this preliminary work will only test and increase their powers, give them increasing responsibility and prepare them for their final rôle.

The plan to carry out the above is in no sense original and is no doubt now in the files of the Navy Department worked out in detail by the late Admiral John Hood, who was a captain on duty in the General Board in 1912 when he had the task of preparing a plan for promotion. He had available all data and suggestions and had the necessary assistance. Promotion by lot to various grades to eliminate the hump had even been suggested. His plan was given little consideration due to the fact that a plan was required that would increase efficiency with no increase in cost. Captain Hood, however, made use of retired officers as will be briefly outlined, and he also pointed out that officers with 14 years' service would be the best nucleus of a reserve force that could be obtained. The additional expense of this limited number of retired officers would be a small item of the expense of a Naval Reserve Force now generally recognized as a necessity.

BRIEF OUTLINE OF CAPTAIN HOOD'S METHOD OF PROMOTION

A certain number of officers graduate from the Naval Academy. The number of graduates to be commissioned may later be reduced when the navy has its authorized officer complement. Warrant officers commissioned with a class will for promotion purposes be considered as a part of that class. Three years after graduation this class is due for promotion to lieutenant (j. g.) and six years after graduation to lieutenant. Fourteen years after graduation this class comes up for lieutenant commander.

Selection here enters after 14 years' service, in which time all officers have had an opportunity to develop. The average loss up to this time resulting from death, court-martial, resignation, and failure to pass examinations was given in the original plan. Of those remaining in the class, a certain number or percentage are selected to fill the lieutenant commander grade (there was, I believe, some slight elasticity in the number of this grade), the remainder will automatically retire on three-quarters pay. The term selection is used instead of elimination as the attitude of the board should be that of selection. Officers might be selected for initiative shown, work accomplished, and responsibility assumed, whereas, if ordered to pluck, a board might be on the defensive in its actions and these same officers might be plucked; letters of censure or failures recorded serving as a reason or excuse. It was not claimed that the best would always be selected up any more than it can be claimed that class standing indicates accurately the true knowledge obtained at the Naval Academy but it approaches service standing as Naval Academy standing approaches academic standing.

This process is continued in each grade after a definite number of years' service in grade. This one class can be followed through to the rear admiral grade where probably only about two are selected. The average age of reaching the grade of rear admiral was, I believe, 55. There was no penalty for entering the Naval Academy a year or two above the average age except that if selected to rear admiral it would be at an age of 56 or 57, instead of 55. This is a survival of the fittest with a vengeance but there is no hurdling or re-hurdling and no stigma or hardship attached, but as an asset a wonderful reserve nucleus is created.

USE MADE OF RETIRED OFFICERS OTHER THAN IN THE RESERVE FORCE

Captain Hood outlined certain shore duties that might be assigned to retired officers upon their request. This included recruiting stations, hydrographic offices, navy yards, and many important duties; supervision over all activities was, however, left in the hands of active officers. By this method, the number of officers could be increased at under officered stations and many active officers could be released for other duty. A retired officer would perform active duty on shore only and only at his own request, the incentive for a retired officer to ask for this duty would be his interest in the duty and its permanency, he could have a regular home of his own which would greatly decrease expenses and he would be allowed to take short cruises to keep in touch with the navy afloat. At the end of about 20 years it was estimated that all duty to which retired officers might be ordered would be filled by them, and the question of shore duty for active officers would present itself. Captain Hood approved of definite tours of shore duty for active officers and pointed out that there were many billets on shore open only to active officers and further pointed out that there is no limit to postgraduate courses for junior officers or war college courses for senior officers and that it would be practically impossible to give officers sufficient postgraduate and war college work unless a large per cent of shore billets were taken by retired officers.

I have not gone into details but as near as I can remember the above was Captain Hood's plan which was worked out in minute detail and is no doubt available and is as applicable now as when written. This plan was probably the most carefully worked out of any plan ever suggested. Its only criticism being that it would cost more money than some other plans but as previously stated this excess of retired officers would form a small part of the present reserve force which of necessity must be expensive, but is recognized now as essential.

Naval Aviation and a United Air Service

(SEE PAGE 307, WHOLE No. 217)

CAPTAIN RALPH EARLE, U. S. Navy.—The placing of all aviation under the misleading and catch word title of a united air service has been for some time and still is a very seriously discussed measure. Such a proposed organization would actually instead of uniting anything rob the

army and navy of a very vital part of their power by adding a new and independent force to our fighting arms with all the multitudinous interferences and complexities involved thereby. Such procedure is akin to robbing a person of the use of one arm by having its movements controlled by a brain over which he had no authority. Instead of unity of action there would result in every conceivable operation dual control. A military or naval undertaking cannot succeed save only under one commander.

I wish that all those who may have the responsibility for deciding finally whether or not the United States should have a united air force would place themselves, prior to making such a weighty decision as an orientation point from which to consider the various arguments pro and con, in the dark days of late March, 1918, when the great offensive of the German Army began on the 50 mile front from Arras to La Fere. Can they believe that divided control of the Allied forces would ever have beaten that host? Not until some time after Marshal Foch was chosen as the Allied Commander-in-Chief under date of April 3d did the checking of the German onrush become a fact, and the counter offensive begin that October 1st caused German leaders to make frantic efforts for an armistice; and who believes to-day, but what that, if it had not been for the unity of command so fortunately decided upon, the result of the war would have been far less satisfactory to us. This unity of command included control of all the air forces operating with the armies.

A united—What a clever way of spelling divided!—air force? By all means, *No*, never. Remember the lessons of those dark days. Unity of military command, and in that command, unity of action are clearly indicated and must be conserved. An air force that cannot operate with, or in other words is not an integral part of either an army or a navy is not worth while possessing. Before a force can be a unit, the members thereof all must be truly a part of it in doctrine, training, and understanding. The captain of a battleship must know his gunnery officers and their capabilities as developed by association with him if he would shoot accurately, similarly he needs to have his aviators be they scouts or spotters or torpedo plane pilots or what not speaking his language and so each carrying out his mission to the full. It must be apparent to all that the pilot of a seaplane or plane scouting for the navy who is not a seaman, and thus understanding naval tactics and the uses of types of sea forces, is of *little* real value to the commander at sea.

I do not believe that one can truthfully say that the formation in Great Britain of a united—*i. e.*, the Royal—air force has been a success, or that it ever was a success even though all of us will cheerfully admit that Sir William Weir, its first head, was an exceptionally capable man. The formation of this force led to many promotions in rank but hardly to advancement in efficiency of the air services. In fact progress seemed to stop then and there. We recollect that almost immediately after formation of the Royal Air Force in 1918 the British Navy was compelled to organize a separate navy air force in order to be enabled to

carry out operations in the Dunkirk area. Then again did not their navy have to operate lighter-than-air craft at that period and independently of this main organization? Surely these facts indicate something amiss with united control of air forces.

The fallacy of the argument so often used that it would be economical and for the best of military and naval interests to combine the production of machines under one organization is exceedingly well brought out by Captain Craven. Seaplanes and land planes are certainly dissimilar and becoming more so as time goes on. So different are they that one cannot conceive of one organization producing all types efficiently. A big organization is too unwieldy. All such are hard to start, and at the same time, once started are difficult to stop even though headed straight towards dire disaster, such is their momentum. Overhead costs then become enormous, conferences and counter conferences, orders and disorders become the rule of the day. No sailor knows all about the soldier's job and the converse is true. Entire amalgamation is beyond the realms of possibility.

There is a tendency to misread certain arguments or statements usually critical of the lack of progress made along certain lines by attributing such to navy—or army—conservatism. Difficulties are encountered in all development, but to attempt to overcome them in a manner akin to that of increasing the number of inexperienced cooks engaged in making a broth which all admit doesn't help the broth at all, is most illogical. A united air service will multiply the men, civilian office holders and others, necessary to get results by hundreds, and, as they will try to cooperate by conferring with sailors or soldiers, the number of the latter also must be increased to permit such procedure. No economy in such methods!

An unbiased thinker surely must agree with Rear Admiral Adair when he remarks in his strictures on the operations of the Royal Air Force in the House of Commons, December 10, 1919, after reciting its many shortcomings—"I would go so far as to say this, that, had the progress of the Naval Air Service been left to the hands of the Navy, the German Fleet might have been destroyed in Wilhelmshaven long before the armistice. That is rather a severe charge to make, but I think it is one that is justifiable." In other words a third arm, that can never appreciate the conditions peculiar to the other two, is and must always be an obstacle to progress. The navy must control the surface of the sea, all the waters below and the skies above. This conception of course is not new, it is what I believe the navy has always stood for, and should continue to insist upon. Possibly a sailor should not speak of the army and its aircraft as he cannot be supposed to be as competent to manage such, as are army officers, nor does he have to; as, fortunately both General Pershing and Field Marshal Haig have given views upon the undesirability of a united air service in language and positiveness that leave nothing to be desired. Their views are made available to us in Captain Craven's article and merit all consideration.

We now have no cabinet post for the commissioner of automobiles to take care of those machines operated by civilians, nor do we need a

cabinet officer to care for such aircraft as may be privately owned and operated. Their proper control will come coincidentally with their use.

Statements as to lack of progress are usually too vague and so unfair as to hardly merit answering in detail. Despite all critics there has been great progress in all branches of aviation; far greater than advocates of a united air service are willing to admit and which the services themselves cannot in reason disclose or give publicity.

The last paragraph of Captain Craven's article is indeed expressive and sums up the situation tersely and should be read by those who may eventually decide the great question at issue. By observance of its precepts and by the emphatic rejection of a united air service great saving in expenditures and real progress and actual leadership in the air will be our country's portion.

LIEUT. COMMANDER W. A. EDWARDS, U. S. Navy.—Captain Craven, in his admirable article, "Naval Aviation and a United Air Service," hits the nail squarely on the head when, in conclusion, he states that:

"In view of the definite opinions publicly expressed by leaders in the great struggle of the recent past, it is obvious that advocates of the United Air Service, if acquainted with actual conditions and requirements, are basing their arguments in favor of such an organization on other than military grounds."

If these advocates of a United Air Service are not acquainted with "actual conditions and requirements," then their testimony is of no value, and they should be disqualified and eliminated forthwith as incompetent witnesses.

If, however, they are familiar with "actual conditions and requirements," it is perfectly obvious, as Captain Craven tritely remarks, that they are basing their arguments on other than military grounds.

Can it be possible that the dazzling rays from the "brass hats" contemplated in the proposal to create a United Air Service, consisting of a secretary, an assistant secretary, 1 major general, 15 brigadier generals, 165 colonels, 300 lieutenant colonels, 605 majors and 3850 officers of the lower grades, have so blinded these advocates of a separate service that they cannot see the unsoundness of their arguments from the point of view of the efficiency of the battle fleet?

We are constantly reminded by those who favor amalgamation of the fact that Great Britain amalgamated her two air services during the war with unqualified success and that, therefore, we would be well advised to do likewise. It is, of course, quite true that Great Britain did amalgamate, but with what measure of success still remains to be seen. Captain Craven remarks in this connection: "Rumor has it that all is not plain sailing," etc. We are not concerned for the moment, however, with the success or the failure of the British problem, for the fact remains that Great Britain was fully justified in taking this step when she did for a great many very excellent reasons, none of which, however, apply in the remotest degree to us. In the first place, the fusion of the Royal Naval

Air Service and the Royal Flying Corps into the Royal Air Force was not effected until April, 1918; or, in other words, and this is the meat of the argument, not until after the German High Seas Fleet had been contained, and not until after the submarine menace was overcome to such an extent that the world's output of shipping exceeded the destruction occasioned by the submarine menace. The production and destruction curves crossed in March, 1918. In other words, the situation at sea was well in hand by the time this fusion took place, and, although the naval war had not been won, the navy had already accomplished its primary mission and the freedom of the seas was assured to the Allied cause.

Now, what was the strategical situation on land at that time—April 1, 1918?

Admittedly, it was far from being satisfactory, and I do not think that it is any exaggeration to say that it was critical. What, therefore, could have been more natural, more imperatively logical, than the action taken by Great Britain in reinforcing her hard-pressed armies on the various fronts, with the supernumeraries of her naval strength—the Royal Naval Air Service? The situation was critical. The immediate mission was to win the war at all costs and with a disregard of post-war or any other consequences; and the most expedient way was by amalgamating the two services.

This international emergency situation is paralleled on a minor scale by that of our own Northern Bombing Group with reference to which the Commander of the U. S. Naval Forces Operating in European Waters estimated as follows, in the early fall of 1918:

"Enemy have evacuated naval bases in Flanders; the mission for which the U. S. Naval Northern Bombing Group was organized is therefore accomplished.

"The proposition of employing this unit in Italy has been actively under way for some time, but several months must elapse before operations there can begin.

"Consideration has also been given to the project of continuously bombing enemy naval bases in the Heligoland Bight, but for this purpose planes of greater radius and greater carrying capacity than are at present available must be built and equipped. A considerable interval of time must be allowed before this can be effected.

"The personnel necessary for the above-mentioned undertakings has, after six months of unrelenting labor, been obtained and organized into an operating unit, which, if disbanded at this time, would be most exceedingly difficult to reconstruct. In the present emergency, therefore, which is felt by everyone to mark the crisis of the war, it is most urgently represented that it is the duty of the Navy Department, in consideration of the foregoing, to depart from the principle laid down that navy personnel should only be used against purely naval objectives and that the services of the U. S. Naval Northern Bombing Group be offered to the Commander-in-Chief of the American Expeditionary Forces, to assist in hastening the victory which is impending.

"It is moreover definitely determined in the event of the above change of objective being agreed to by the department that preparations shall continue unremittingly, (a) to prepare an offensive operation against enemy naval bases in the Adriatic; (b) to prepare an offensive against the German North Sea coast, either with more powerful machines, or, in the event of a military situation, allowing of a nearer approach to Germany with the present types of machines. As soon as the preparations for either of the above objectives permit, the U. S. Naval Northern Bombing Group shall at once be withdrawn from army work and returned to naval work."

If this constitutes a sound argument for the permanent amalgamation of our air forces, then there exists an equally sound argument for the amalgamation of the army and the navy into a United Defense Service.

The fundamentally basic principle of warfare is that unity of command is essential to success; conversely, divided control spells disaster.

There can be absolutely no doubt that, in the next war, the Fleet Air Force will be just as much an integral part of the fleet as the submarine force or the destroyer force, if not, indeed, more so. As such, it must remain under the control of the commander-in-chief not only during battle, but during the pre-war period of preparation for hostilities.

In commenting upon the Royal Air Force in "The Crisis of the Naval War," Admiral of the Fleet, Lord Jellicoe, asks these questions:

"With the air service under separate control, financially as well as in an executive and administrative sense, is it certain that the Admiralty will be able to obtain machines and the personnel in the necessary numbers to carry out all the experimental and training work that is essential for efficiency in action? Is it also beyond doubt that unity of command at sea, which is essential to victory, will be preserved?"

Let us apply these exceedingly pertinent questions to our own situation and look at the problem from this point of view.

What is the answer?

The answer is no.

CHIEF CONSTRUCTOR D. W. TAYLOR.—The question of a United Air Service, or as I think it should preferably be called, an Independent Air Service, has been a good deal discussed in the last year or so, and apparently the discussion is going to continue. The matter is one of primary importance, affecting the national safety, and an incorrect decision in the next year or so will do harm which will take years to overcome.

Questions of material in this connection are, it seems to me, though serious, of minor importance compared with some fundamental questions involved.

I have heard a good deal about the alleged excessive overhead due to separate services; but the advocates of an Independent Air Service make no mention of the obvious fact that the expense of the necessary liaison between an Independent Air Service and the army and navy would be much greater than any possible reduction of overhead by amalgamation. The

mere fact that army and navy machines both fly does not mean that they should be identical. Captain Craven makes this very clear. The fact is that the general situation as regards material is very fairly comparable to the ordnance situation in the army and navy.

Apart from material matters, there are at least two fundamental objections to an Independent Air Service based upon human nature—a thing which changes very slightly if at all from generation to generation. Suppose we had an Independent Air Service handling all aviation. That air service, being manned by humans, would naturally and inevitably concentrate upon the offensive side. It would deceive itself and deceive the country as to its offensive capabilities. Only by exaggeration in this respect could it get money from Congress in competition with the army and navy. From the naval point of view, while the offensive is of major importance, adequate defense in the air against the enemy's offensive is also essential. Until human nature has changed, the navy would have no such defense at its service with an Independent Air Service and would be at a most serious disadvantage in dealing with a navy which had a properly balanced air service branch.

Another fundamental objection of the same kind to an Independent Air Service is touched on by the author. History has shown that combined operations of the army and navy have always been carried on with greater difficulty and less efficiency than independent operations of either arm. Of course it is easy to say that this should not be so, but it has been so in the past, and will continue to be so until human nature manifests itself differently from its manifestations in the past. Now with an Independent Air Service, every operation of the army and navy in war will be a combined operation so far as we can estimate at present. At least this will necessarily be the case if aviation develops as we all believe. The resulting inefficiency inevitable in combined operations would be a most serious handicap upon both the army and the navy. Almost certainly the result of an Independent Air Service would be in time that we would consolidate army, navy and air service under one head—a Minister of Defense. We should then be exactly where we were in 1789, when the Secretary of War (not Secretary of the Army) controlled both army and navy. This arrangement lasted nine years, and during this period there was much criticism of the administration of naval affairs. Early in 1798 an investigating committee of Congress reported that apparently enormous expenses and unaccountable delays had attended the naval administration of the War Department. So the Act of April 30, 1798, established the Navy Department.

If we establish an Independent Air Service, the next step will be a Minister of Defense. Then, after the same troubles as from 1789 to 1798, we will again divide into the army and navy. In my opinion the ultimate result of an Independent Air Service would be that in from 5 to 15 years after its establishment we would have again the same organization as to-day.

The Fate of the Dreadnought

(SEE PAGE 191, WHOLE NO. 216)

LIEUTENANT F. S. LOW, U. S. Navy.—In the article, "The Fate of the Dreadnought," published in the February PROCEEDINGS, it seems indeed very fortunate that the authors did not permit their assumptions concerning the characteristics of various types of ships to lead to any definite conclusion as to the course that will be followed by naval architects. This statement is made because it appears that many of their suppositions and statements of fact are not only at variance with accepted practice but also with every theory we have derived from research and experience. The discussion is based upon such faulty premises that were not these errors pointed out, many readers not only might, but undoubtedly would, receive an extremely misleading conception of fundamentals which have to do with the construction and operation of submarines.

The distinction drawn by the authors between a submarine and a submersible is no longer acceptable. To quote Monsieur Laubeuf the originator of the submersible. (*Le Yacht*, Janvier, 1910.)

"The difference consists in the form, the method of construction and the buoyancy. The pure submarine has circular cross-sections and a hull in the form of a cigar; the ballast tanks in the interior of this hull and reserve buoyancy is small.

"On the other hand, the submersible has a form which approaches that of an ordinary ship and the cross sections are not circular; it possesses a double hull in whole or in part, the ballast tanks being formed by the space between the two hulls. The reserve buoyancy is great."

As a matter of fact, due to the great strides made in submarine construction in recent years and to the application to one type of ship of so many qualities which formerly were thought of as a distinct feature either of the submarine or submersible, the time has arrived when all vessels that are capable of travelling beneath the water are classed generically as submarines.

In the article under discussion it is stated that the contemplated submersible battle cruiser would have little or no armor, "because, while on the surface she would lie awash, or nearly so, and would not need it." How, by any stretch of the imagination, can cause and effect be so related? If we construct such a battle cruiser and equip her with heavy guns, we presumably except her to fight them, and our estimate must be very low indeed, both of the destructive effect of a heavy caliber shell on the unarmored deck of a submarine and of the fire control efficiency of any probable adversary, if we are to assume the untenable premise that a submarine cannot be hit and the equally fallacious corollary that if a hit is made, only minor damage will result therefrom. The life of a submarine is generally, and quite properly, reckoned as one hit from any caliber gun. The most enthusiastic advocate of the submarine will hardly deny that at least one good, solid, major caliber hit can be inflicted by

capital ships on a submarine at battle ranges; this, in spite of the inherent advantages possessed by the submarine in her low visibility and the small area of her exposed, above water surface. In other words, if we are to construct a submarine capable of joining in a gun duel with a capital ship, we cannot rightfully assume that the submarine will be impervious to shell fire. It may be difficult to hit her, but she *will* be hit and while one shot may not result in sinking; it is very probable that diving ability will either be seriously interfered with or entirely destroyed. Then she will be at the mercy of the enemy.

It must also be borne in mind that no matter what type of construction we apply to our submarine, she will always be more or less of a poor, low and wet, gun platform and will provide only limited fire control facilities; for once the compromise between surface craft and submarine is permitted to swing too far in favor of the many desirable surface qualities, the value of the submarine as such, is decreased in proportion as the surface efficiency is enhanced. We cannot have high surface and submerged efficiency in a submarine any more than we can have both the heaviest armor and armament in a dreadnought. The balance must be struck.

In one part of the article, speaking of the submarine battle cruiser, the statement is made that "it is easy to imagine" such a vessel acting as a destroyer, making and repelling torpedo attacks and carrying out screening operation," and a few pages following, in speaking of the same type of ship, we read the remarkable and contradictory statement, "If it tried to operate on the surface as a destroyer, it would lack the destroyers' speed and flexibility. "Pursuing this course of reasoning and accepting the latter statement, it appears that a severe strain might be placed upon the imagination and the success of the venture even put in jeopardy, if we are to acknowledge, without comment, the truth of the first assertion. In our entire consideration of the submarine battle cruiser it is well to remember that while the theorists' conception of a submarine may be a vessel capable of almost instantaneous transition from surface to submerged and submerged to surface capabilities, in practice, it will be found that it is not the gay proceeding of diving and surfacing like a porpoise but, in fact, that each maneuver requires the expenditure of altogether too many precious moments to get the vessel under proper control for gun or torpedo fire. The same reasoning holds true here. We cannot have a submarine possessing the same surface qualities as a destroyer.

We are all prone to accept with great enthusiasm and almost unbounded faith the advent of a new device, which, it may seem, will aid us in accomplishing the end we have in view. Such is the case with the anti-submarine devices developed during the war. The very secrecy in which all development and research work has been veiled and the popular ignorance of the true limitations of these devices, have given to them a potential power of detection, transcending the most enthusiastic claims of their inventor. We have training wires and eels, SC, MB, MV, K and Y tubes and, I presume, many other contrivances whose avowed purpose

it is to seek out and destroy submarines and his name would be fool, who would deny the merits of these ingenious devices. But how, by any stretch of the imagination can we say, as do the authors, that the anti-submarine devices were fatal? To the reader who has had access to the records of anti-submarine experiments, it must appear so, but it will also be found that many of these experiments were carried out under perfect weather conditions, with certain elements of the artificial entering into the tests and that in a majority of the most successful tests, the listening was done by the inventor himself; a man whose broad knowledge of physics and acoustics and natural high proficiency in handling the invention of his own mind, puts him completely out of the class of ratings that we, in service, must depend upon. It will not be denied that anti-submarine devices helped materially in combating the submarine menace but it must be emphatically denied that they were fatal. They were a hindrance to submarine operations and a bothersome thorn in the sides of submarine commanding officers but, if we are to accept the statement that these devices sealed the fate of the submarine, so then, must we also accept every incorrect and unbased conclusion that flows from this source. If the fate of the submarine has already been sealed then why is every important naval power in the world continuing submarine construction? For our own protection, we cannot subscribe to such morbid delusions and transgressions of fact.

In the particular type of anti-submarine warfare in which the Allies were engaged against Germany, practically every condition of sea and land was favorable for this work. The German submarines were, for the most part, operating in restricted areas and comparatively shallow water. Both of these conditions made the anti-submarine devices more effective. It is hardly conceivable, and is not generally admitted, that submarines will ever again be employed under the same conditions and in the same rôle as were those of Germany. Hence, it will be found that our estimate of the capabilities of anti-submarine devices will have to be materially changed in drawing up plans for their use in possible future wars. Do we know, for instance, that their efficiency will be the same when operating in hundreds and thousands of fathoms of water as when employed in the comparatively shallow waters contiguous to the British Isles? Do we know that anti-submarine craft, equipped with all the most modern devices, can be employed to advantage against large fleet submarines in the open sea, when a large number of high powered ships, causing great sound interference, are present? Countless numbers of similar questions could be propounded and the answer to all of them, based not on theory, but upon lack of conviction in practice, would be the same. We not only do not know these things to be true but we have every reason to believe that these marvellous, delicate instruments will not obtain the results which their advocates claim for them. It may be well to state here that I speak not merely from the perusal of records but from experience both in the capacity of the pursuer and the pursued.

It is perhaps well that the technical discussion as to the inability of the submersible to dive and go to great depths was dispensed with, for it is believed that proof of these statements would involve a laborious and circuitous process of reasoning not founded on fact. While it may be conceded that large submarines will, perhaps, take a longer time to dive than small submarines, there seems to be no good reason why this time element should be of such duration as to endanger the safety of the submarine. If such a reason does exist, then why build submarines? Neither is there anything to prevent the construction of large submarines capable of going to the same depths that are required by the specifications of our present day submarines.

That part of the paper which has to do with the motive power of submarines is so misleading as to require almost complete refutation. The gasoline engines formerly used for submarine propulsion were, of course, not only dangerous because of the inflammability of the fuel but also, because many men were permanently poisoned by the noxious fumes of combustion. While it cannot be stated that the Diesel engine is a perfectly reliable machine, the cruising performed by German submarines during the war, and the every day runs that are now being made by Diesel engine merchant vessels all over the world, are in themselves sufficient evidence to confute the statement, made by the authors, that excessive weight and general unreliability accompany all internal combustion engines. If steam were used for surface propulsion there might be no necessity for other means of surface power but if there were, it is difficult to understand why, as they contend, a ship of the size under discussion could not be equipped with any other type of motive power, in addition to her steam installation. Indeed, the very increase in size is the reason why more machinery could and would be installed.

While it is true that the lead-acid type of storage battery does, under certain conditions, generate chlorine and hydrogen gas, in our service the casualties resulting from such generation of gas have been so few as to warrant the statement that their prevention and diffusion involve nothing more than ordinary, routine care. It is a sad fact, known by many in our service, that the alkaline battery, stated by the authors to have replaced the lead-acid battery, is capable of copious generation of hydrogen gas. The foregoing is one of the main reasons why, several years ago, after an unfortunate explosion of the experimental alkaline battery installed in the *E-2*, this type of cell was condemned for all future construction. There is not now one single alkaline storage battery, installed as the main battery of a submarine in our navy.

With regard to the use of the torpedo, it can hardly be conceded that a torpedo hit is purely a question of luck, as the authors state is to be. To be sure, an isolated long range shot, fired in the expectation that it will hit a certain definite target, is an absurdity. If, however, we are to have fleet submarines, we will have enough of them and they will each have a sufficient number of tubes to fire "Browning shots," with the practical

certainly that a percentage of torpedoes fired will cross the enemy line. Hits may or may not be made, but the enemy cannot but be greatly inconvenienced and hampered by such an attack. Jutland proves this.

This criticism has been written, not with the intention of discrediting views held by others, but rather, because of the general lack of knowledge on the part of the service at large concerning submarines, it is not deemed proper to allow to go unchallenged, statements which, owing to their wide variation from fact and practice, may only tend to more thoroughly confuse the submarine controversy. Such comments as have been made would be injurious rather than helpful, were not some consideration given to the ultimate development of the submarine.

There is, I believe, unanimity of opinion that submarines serving with fleets of capital ships must fulfil the following general requirements:

- (a) Large cruising radius.
- (b) Sufficient surface speed to accompany the fleet under all conditions.
- (c) Good sea keeping qualities and habitability.
- (d) Powerful torpedo armament of long range torpedoes.
- (e) Good average diving and submerged qualities.

Some of the foregoing characteristics have already been attained and others are rapidly approaching a satisfactory solution. We know, from experience, that they are necessary; whereas the discussion of the submersible battle cruiser is still in the academic stage and all theories now held must travel the tortuous road of satisfactory demonstration. With our general requirements before us, the sphere of the fleet submarine is not difficult to determine. The submarine force will be just as much a part of the fleet as the destroyer force is now. By reason of the fleet submarines' ability to accompany the fleet under all conditions, the commander-in-chief may find it expedient, and particularly to his advantage, to use the submarine force.

(a) To attain a favorable position before they submerge for torpedo attack.

(b) To gain and hold a position that will force the enemy to accept an inferior tactical position.

In both of these cases we have the *raison d'être* of high surface speed. To obtain it, some other desirable quality, probably submerged speed, must be sacrificed and in order to deliver successful torpedo attacks against high speed surface craft, it is readily apparent that it will almost always be necessary to gain a fairly good surface position before submerging. It is noteworthy that the world wide tendency is to sacrifice submerged speed to surface speed.

Considering (b) above it is generally admitted, and has proven true in practice, that whereas surface craft that have the task set for them of turning an enemy column, may be driven off by a superior force, a group of submerged submarines is a real and a moral deterrent and may succeed when surface vessels fail.

After all, since the purpose of the battle is to destroy our adversary, it matters little as to what means and weapons are employed to effect this end. Even though the submarine force is unable to consummate a torpedo attack, the general plan is carried out, and if the enemy is forced to avoid the locality in which our submarines have been placed and thereby accept a tactically inferior gunnery position, the task of the submarines will have been well accomplished.

The Soul of the Service

(SEE PAGE 351, WHOLE No. 217)

CAPTAIN W. T. CLUVERIUS, U. S. Navy.—1. The anomalous condition of a shortage of more than 50 per cent in total authorized commissioned strength combined with an actual excess in the complements of the three lower grades of the line is enough to try the "Soul of the Service."

2. Captain Jessop's article is timely for it is necessary indeed, in this serious post-war period, to determine first, what professional attributes are missing in the quickly-promoted junior officer and then, what modifications in training must be made in order to re-equip him as nearly as may be for his life's work. The writer inquires into these points well and finds that all the losses are based in that inclusive one of experience. With it was lost training in that subordination which comes with training at sea, close supervision by older officers and the benefits of that association, and the crystallizing of ideals of duty which, because they must be deep rooted, are of slow growth.

3. Much in these elements was lost to the junior officer of the line long before the World War—lost with the passed midshipman and the two years probationary period at sea where, under continuous control, the aspirant for a commission was trained in the duties of a subordinate and drilled in the acceptance of responsibility. He learned the details of his profession from his division officer, and, day by day, military character was formed.

4. Annapolis has realized and shouldered these losses, especially those entailed by the rapid promotion in war, and is trying to bridge the arc as best it may in a systematic manner.

5. The Naval Academy is often criticized for this or that lack in professional equipment discovered when the graduate joins a ship. Professional demands, both practical and theoretical, are greater than ever before and growing. It is simply impossible to cover the field in four years. Yet at all times there are attempts from without to shorten the course of instruction when the need is to lengthen it. There are those, too, who say let them get this or that aboard ship. Some of the essentials of our profession can never be absorbed after graduation. The abandonment of the two years' cruise was a lesson in this matter: the ensign of to-day lacks much professionally that the ensign of yesterday acquired as a passed midshipman.

6. I agree with Captain Jessop that academic methods suffer restriction and must of necessity at certain points be artificial. Nothing can make up for experience. A midshipman must stand on his own foundation and a gradation by marks is imposed. This is the only criterion of academic achievement, but I cannot agree that it is "as true of discipline as it is of any other study." Moreover, it is my observation that in all professional departments at Annapolis to-day the "question of the usefulness of what he is being taught" is so continuously brought to a midshipman's attention that to some degree "it must enter his head." Unfortunately in many respects, the proper striving for marks is not prevalent now because a "two-five" means a commission. Too often this mark can be made without sufficient effort and scholarship suffers.

7. There is no one discipline department as such. There is an Executive Department of which, in addition to his other duties, the Commandant of Midshipmen is the head. Under him is a commissioned officer attached to each company of the Regiment of Midshipmen whose duty it is to teach his men the executive requirements of their profession; to instill in them the instincts of duty; and to formulate their military character, all the while maintaining discipline and causing them to maintain it.

8. Annapolis is the school of the line of the navy. Midshipmen officers and petty officers are given standardized duties and comprehensive authority in the exercise of command which is the function of the line. They are guided, advised, and backed, by the commissioned company officer. With the midshipmen's responsibility based on regimental ranking and rating come their privileges: not with longevity, that is, not with class.

9. Similarly in the professional departments, the commissioned personnel are held accountable for the maintenance of discipline and the determination of military character displayed by the midshipmen when engaged in those departments. Just as the gunnery officer, the engineer officer, and the navigating officer are responsible in our ships, so are all officers attached to the Naval Academy. The Commandant of Midshipmen corresponds with the Executive Officer in coordinating the whole.

10. The matters of leadership and command are constantly dwelt on by the Executive Department and service interest is enhanced by a succession of addresses made not only by the most distinguished officers of our fleet and service, but also by foreign flag officers and general officers whose names are world wide and who are frequent visitors to Annapolis. Without exception they remark on the spirit they find and in their contacts with midshipmen, dwell on our glorious traditions which are an inspiration to further effort.

11. Yes, Annapolis is striving to the utmost to fill the gaps. But training in the full sense of duty when it comes and the assimilation of the spirit which Annapolis enjoins is a post-graduate course for the fleet, and the fleet must see to it that no "naval holiday" in these essentials is permitted. On the contrary it is the bounden duty of every officer in the fleet to show in himself that the newcomer's vision of service is unimpaired.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership Life, regular and associate, 5349. New members, 110. Resignations, 12. Dropped, 402.

Membership Campaign A membership campaign is being conducted, both among officers of the regular service and of the Reserve Force. It is believed that *all officers* should support the Institute by joining. Publication costs are such that a large membership is imperative. The PROCEEDINGS are an excellent medium for keeping officers, and particularly those in an "inactive status," in touch with naval affairs.

Dues The annual dues (\$3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

Address of Members *All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt.* Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 15th of each month.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Boat Book, 1920, is now ready for issue. The price is not yet fixed, but will probably be about 50 cents per copy.

The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147 and 173 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, Md., March, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO.....	I
PUBLICATIONS, U. S. NAVAL INSTITUTE.....	(2)
SPECIAL NOTICE	652
TOPICS FOR ESSAYS	653

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

not in numbers, not in outward force, but in the spirit of devotion to duty of officers and men, and it is a sad fact that the spirit of the fleet is being poisoned by anti-patriotic propaganda, and that state arsenals, Toulon especially, are hotbeds of anarchy. Stern repression and counter-propaganda are the urgent remedies.

Although the Chef d'Etat-Major Général de la Marine cannot be said to enjoy quite a great power and influence as those exercised by the British First Sea Lord, he is the most important man at Rue Royale, and the only official in a position to enforce some continuity of views and efforts, and to make up in some measure for the continuous change of improvised Ministres de la Marine. Hence the importance that attaches to the dismissal of Admiral Salaun, who came to power just over a year ago, and was the real Minister of Marine under the nominal responsibility of the honourable Mons. Landry, who received "le portefeuille de la Marine" by mere luck, and was totally unprepared for such vital functions. Whilst there have been no fewer than eight Ministers of Marine since 1914, the number is limited to five Chefs d'Etat-Major, viz., Aubert, de Yonquières, de Bon, Ronarch, and Salaun, and of these Ronarch appears to be the only one who had a constructional program of his own, and could have achieved something had his authority been greater. As to Admiral Salaun, he came to Rue Royale with a high reputation, and much was expected of him, but the sad fact is that he leaves the navy, in every way, in a poorer

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U. S. NAVAL INSTITUTE PROCEEDINGS NO. 216

THE FATE OF THE DREADNOUGHT

By LIEUT. COMMANDER G. B. VROOM, U. S. Navy, and
WILLIAM OLIVER STEVENS

CORRECTION

The statement that "the alkaline type of battery has supplanted the acid type" should read: "it has been attempted to supplant the acid type battery with an alkaline type, so far without success."

WHOLE NOS. 6, 7, 10, 13, 14, 15, 17, 144, 145, 147 and
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INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO.....	I
PUBLICATIONS, U. S. NAVAL INSTITUTE.....	(2)
SPECIAL NOTICE	652
TOPICS FOR ESSAYS	653

PROFESSIONAL NOTES

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GENERAL ARRANGEMENT

VESSELS BUILDING.	}	France	577
NAVAL POLICY.		Germany	579
MATÉRIEL.		Great Britain	585
PERSONNEL.		Japan	595
MERCHANT MARINE.	}	United States	600
AERONAUTICS			610
ENGINEERING			618
ORDNANCE			622
MISCELLANEOUS			623
CURRENT NAVAL AND PROFESSIONAL PAPERS.....			626

FRANCE

THE FRENCH MARINE MINISTRY.—There are signs that Mons. Guisthau, in contrast with his two predecessors, will be a man of action, and will have at heart to be something more than a "Ministre de Parade," and to leave, in a year or so, the Marine Française in a better condition than he finds it, being well aware that something more than eloquence is needed to mend matters at this stage. He wisely decided to get rid of the naval advisers responsible for the plight of the service. The situation is critical, and the gravest question of the moment is recruiting. The strength of navies lies not in numbers, not in outward force, but in the spirit, in the discipline and devotion to duty of officers and men, and it is a sad fact that the spirit of the fleet is being poisoned by anti-patriotic propaganda, and that state arsenals, Toulon especially, are hotbeds of anarchy. Stern repression and counter-propaganda are the urgent remedies.

Although the Chef d'Etat-Major Général de la Marine cannot be said to enjoy quite a great power and influence as those exercised by the British First Sea Lord, he is the most important man at Rue Royale, and the only official in a position to enforce some continuity of views and efforts, and to make up in some measure for the continuous change of improvised Ministres de la Marine. Hence the importance that attaches to the dismissal of Admiral Salaun, who came to power just over a year ago, and was the real Minister of Marine under the nominal responsibility of the honourable Mons. Landry, who received "le portefeuille de la Marine" by mere luck, and was totally unprepared for such vital functions. Whilst there have been no fewer than eight Ministers of Marine since 1914, the number is limited to five Chefs d'Etat-Major, viz., Aubert, de Yonquières, de Bon, Ronarch, and Salaun, and of these Ronarch appears to be the only one who had a constructional program of his own, and could have achieved something had his authority been greater. As to Admiral Salaun, he came to Rue Royale with a high reputation, and much was expected of him, but the sad fact is that he leaves the navy, in every way, in a poorer

condition than he found it; and this is the true criterion of worth. His narrow-minded cuirasséphobie is responsible for the loss of four 25,000-ton battleships that could have been completed by now. His dislike for size caused him in 1914 to reduce from 6000 to 4500 tons the 1914 type of *éclairneur*, and also to oppose the increase of the displacement of the 1919 *croiseurs-légers*, which ex-Minister Landry described as "*petits mais extrêmement rapides et puissants*." There might be plausible arguments for the systematic research of the smallest possible size in every class of warship, but there can be no excuse for the stagnation, waste, and anarchy that have marked the 1920 naval year. The lack of a firm will at the head has never been more patent to observers.

It looks as if the Grand Admiral Aube had left behind him only inferior disciples, respectful of the letter, but ignorant of the spirit of his teachings and without his wide intellectual horizon and managing ability. There was no fetishism about Aube. He was not bound to a narrow, absolute gospel, but above all a go-ahead and broad-minded naval chief, a believer in real work, and he proved it in setting arsenals and private yards in full swing, in ordering the first seagoing submersible, the first armoured cruiser (the 6300-ton Dupuy de Lôme, which was very large for her time), and the finest lot of light cruisers that the Gallic Navy ever possessed.

Whereas Admiral Salaun is a distinguished torpedo specialist and a worshipper of *poussière navale*, his successor, Vice-Admiral Grasset, who is 57 years of age, is an eminent gunnery expert, who pins his faith in long-range firing and in heavy mastodons large enough to carry the offensive and defensive qualities required to meet the novel conditions of warfare. In the several scholarly volumes he published before the war he accurately guessed what would be the evolution of the naval art, and many consider him as being the most sagacious and broadminded French student of sea warfare. He is highly respected in and out of the service, and will enjoy the authority necessary for the successful discharge of his responsible duties. Admiral Grasset commanded in turn (as a captain) the cadetship *Jeanne d'Arc* and the Brest *Ecole Navale*. He had a comprehensive war experience at the head of the Atlantic Cruiser Squadron, and as *Attaché* in London. As *Prefet-Maritime* in Cherbourg, he turned into a position of active duties and go-ahead work, a post that is usually considered as a well-paid sinecure. He enforced discipline in the arsenal, and even *bona-fide* work, and organized naval sports on a large scale, one of his pet ideas being the continuation on the sporting fields of the Franco-British fraternity of arms. He thus appears to be excellently qualified to try and bring anew the *Marine Française* to life.

Minister Guisthau has selected to be *Chef de Cabinet* Capt. Durand-Weil (44 years of age), who, though being one of the youngest officers of his rank in the service, had been placed in command of the fleet flagship *Provence*. This brilliant and scholarly officer, who has the distinction of being the youngest *Chef de Cabinet* on *Marine* records, possesses considerable personal experience in Admiralty work in war time, and may be trusted to set the cumbrous *Rue Royale* administrative machine working at a more efficient pace. In naval doctrine he is no bigoted sectarian, but an open-minded champion of efficiency in all classes of vessels, and ready to welcome all sound weapons likely to add to the power and security of his country, battleships included. Like Admiral Grasset, he counts many English friends.

Mons. Guisthau's projects of undeferred work will be greatly facilitated by the widespread feeling among the public that glaring incompetence and apathy at the head have "*saboté*" France's naval weapons ever since the armistice. Verbiage, anarchy, and powerlessness in the *Conseil Supérieur*, squabbles in the *Parliamentary Commissions de la Marine*, grand paper programmes changed every few months, but no new construction, no *bona-fide* war training, sum up the activity within the last two years of the ex-grande *Marine Française*, and waste and decline are the only apparent

return the Republic has got for the expenditure of over two milliards francs (1919-20 Budgets). No wonder France at large is utterly sick of words and paper achievements and demands "men of realization" and immediate action.

The Ligue Maritime, that counts 175,000 members, has addressed to President Millerand a petition in favor of the completion of the 25,300-ton *Normandie*, *Gascogne*, and *Flandre* that are afloat, with from 12,000 to 14,000 tons of materials worked into them, and could be made ready within fifteen months. The *Languedoc*, launched in 1915 at Bordeaux and not quite so advanced, is likely to be converted to auxiliary uses. The enormous cost of completing these ships, with a few modifications in the original design, will probably cause only two to be taken in hand, namely, the *Gascogne* (fitted as flagship) and the *Normandie*. These two ships, now at Lorient, would be completed side by side in that arsenal, that would be temporarily retained as a port militaire. Time and money would be saved by this concentration of battleship work in one yard. It will be agreed that two quadruple-turret battleships (12 guns of 13.4 with splendid shells, 24 guns of 5.5-inch, thick and extensive armor, 22.5 knots expected speed, without mentioning a substantial anti-submarine defense)—equal or superior in gun power to any British capital ship in commission, and far superior to the poorly-protected Dorias of Italy—would be worth more to French sea power than the construction of six inferior croiseurs-légers of 5000 tons, all the more so as the five recuperated Boche scouts, due to become available this year, will to a great extent fill the gap for which the cruiser programme was intended. With nine modernized dreadnoughts in the Mediterranean in 1922-3 (mounting 54 guns of 13.4 and 48 of 12-inch), supported by up-to-date aerial and submarine flotillas, France will regain prestige and security and avoid unpleasant incidents. For, as said the grand old man of France, Clemenceau: "Lo grande guerre n'a pas changé la nature humaine; la force reste la seule sauvegarde de paix pour toute nation pacifique."

Professor Flamm's wonderful submarine invention is a further sign that united and thriving Bocheland intends yet making her future on the sea, and renounces none of her former ambitions, but on the technical issue Constructor Laubeuf, the greatest living authority on submarines, has shown the candid Boche assertions to be totally unfounded. "Anybody can design 10,000-ton submarines. I could, if desired, design to-morrow 25,000-ton submersibles, but reliable successful construction is the difficult thing; and then there is the question of cost and military utilization. In the matter of armament, the Boches have found nothing that was not already existing or experimented upon, either in France or in England." For the price of a 10,000-ton submersible it will always be possible to get better value in fast surface ships, or in smaller underwater craft.

Much sympathy is expressed with the British Navy on the loss of the fine submarine, *K-5*. The type is considered as representing a fine constructional achievement, being in the motor part an enlarged copy of the geared turbine French submersibles of the 1912-13 designs. The delays, difficulties, and dangers in diving experienced during the war with the many French steam submersibles have caused the rejection of that type as being "unmilitary." The fate of the *K-5* is an argument against size in submarines and in favor of surface ships.—*The Naval and Military Record*, Feb. 9, 1921.

GERMANY

INDUSTRIAL AND ECONOMIC SITUATION IN GERMANY.—In view of the question of reparation having been brought to the front so prominently in the past few days, two publications which we have received are full of interest. The first is a small book in the French language by Mr. Raphael-Georges Lévy, member of the French Senate and of the Institut de France, entitled

"La Juste Paix," giving "the truth concerning the Treaty of Versailles," and forming mainly a courteous refutation of a book by Mr. John Maynard Keynes. We must confess that we have not read the latter, but the case made out by the French senator is undoubtedly a most able and most complete one. The second communication to which we allude forms a welcome supplement to the first, and is entitled "General Report on the Industrial and Economic Situation in Germany, in December, 1920," by Mr. J. W. F. Thelwall, commercial secretary to H. M. Embassy, Berlin, and Mr. C. J. Kavanagh, British Commercial Secretary, Cologne, issued by the Department of Overseas Trade. Both these communications come at a very appropriate time, in view of the recent inter-allied conferences in Paris, and the meetings last week in London of the Miners' International Federation, to enlighten the general public on the question of Germany's guilt, and on the real value of her assertions as to her incapacity—or, we may say, her capacity for repairing the damage of her own creation—and also on the real state of affairs in that country.

Coal shortage has formed a subject for complaint on the part of Germany for many months past, and the plea still continues to be put forward with great insistence. We have never believed that she has ever had an insufficiency of coal for her works, and the figures given and the statements made in the British report confirm our views in this respect. This report says that a certain proportion of the difficulties encountered in this connection arise from bad distribution, failure of transport, bad commercial markets at home and abroad, lack of orders, seasonal depression, deficiency of raw materials, etc.; a part of these difficulties it is in the power of Germany to remedy without outside aid. That she can do so is clearly indicated by the report, which states that, compared with 1919, railway traffic conditions are much improved, adding "the achievement of German industry and of the government departments concerned is very fine, and shows how great the productive power of the former is if it chooses to make an effort." Among the illustrations given to prove this is one to the effect that the coal situation for the "refining" industry has been considerably eased by the turning over to the utilization of brown coal briquettes, and the building during the war of large power stations at brown coal quarries, thus having provided industry with an economical source of electricity.

Further, it is stated, much attention has been devoted by the rolling mills to the utilization of brown coal, and considerable activity has been displayed in modifying plants to burn this fuel, the production of which in the Cologne Basin has been considerably increased. But our readers are not to infer from these statements concerning brown coal and its utilization that there is a lack of black coal in Germany, for such is not at all the case; they simply show that Germany is putting her industrial house in order on economical lines. Germany is still rich in both black and brown coal, as can be gathered from the figures of output for 1913 compared with those of the present day, and is quite able to supply the "reparation coal" demanded by the Treaty of Versailles. In this connection the number of miners employed is also instructive. According to the British report, the average number of miners at work in Germany during 1913 was 601,700, including 390,600 in the Ruhr district, whereas the total for December, 1919, was 724,597, excluding the Saar, but including 471,359 in the Ruhr district. It is not out of place here to note that the German coal exports amounted in 1913 to 34,573,500 tons, or 3,428,400 tons above the total for 1912. Germany's average annual increase in coal exports was over 2,425,000 tons for the six years from 1907 to 1913. On the basis of these figures her present coal exports, had there been no war, would be over 50,000,000 tons per year, or over 4,000,000 tons per month. Her exports for August last were 2,422,979 tons and for September 2,423,266 tons, consisting mostly of coal to the Allies. That the situation for her is not more satisfactory—

she would evidently prefer exporting coal in the usual commercial way to supplying "reparation coal"—is no fault of any of the Allies.

The question of iron ore supplies is again a vexed question which Germany will probably continue to put forward for many months to come, but she does not lack home iron ore to the extent she pleads, as we pointed out briefly in the course of a former article. At the present time, says the British report, ores are arriving in such quantities as blast furnaces can deal with on their present allotment of coke, but, it adds, steel production is considerably ahead of pig-iron output, partly due to imports of foreign pig, but chiefly owing to the utilization on a large scale of scrap iron. Pig-iron is not made simply for the pleasure of making pig-iron, but for converting it into steel; as Germany obtains her steel chiefly from scrap, and as she has seen to it that she has scrap to last her over a good while, she is not so badly off after all from the metallurgical point of view. At all events, she is not in a worse situation than we are in this country from the iron ore standpoint, as is shown by the following extract from the review by Messrs. William Jacks & Co., on "The Iron and Steel Trades in 1920," which says: "The broad fact remains that the Cleveland district has seen its best days as a mining district. Steel makers have solved the problem of producing high-class steel from basic iron manufactured from Cleveland ironstone only to find that the output of the ore is on the wane." And, we may add, Cleveland steel makers have probably much less scrap to work up than have the German steel makers. Condolence with Germany's situation in this respect is, therefore, somewhat out of place.

Moreover, still according to the British report, the German rolling mills in general are well occupied and, though suffering from a shortage of fuel and raw materials, a fair export turnover has resulted. The tin-plate industry is well supplied with orders. Structural engineers continue to be well employed and are reported to have orders in hand for foreign account; the coal strike in England resulted in orders being placed in Germany, and manufacturers were found willing to make fixed quotations and favorable deliveries. Manufacturers in Germany find little difficulty in working to British standard specifications, although the less stringent specifications of the Prussian railways, which, previously, did much to help the industry, work in their favor when accepted by foreign clients. The prejudice against basic material that was prominent in England, but non-existent in Germany, was not only injurious to the British manufacturer quoting in foreign markets, but of assistance to the German. Another interesting statement which points to the excellent situation of the German metallurgical industry is to the effect that blast furnace and steel works appear to have continued without the large new issues of capital which have been so prominent a feature of the "refining" and engineering trades, "and the explanation is partly to be sought," the report adds, "in the ready market they found for their produce as well as in the good profits obtaining from export." All these remarks are liable to cause foreign ironmasters to view the German metallurgical situation with a certain amount of envy.

And the German engineering industry would appear to be in a better situation still, for we read in the British report that engineering and allied trades show considerable improvement in regard to the supply of raw materials, "cast-iron and steel being more plentiful on the market owing to an improved home production, imports, and also to a slump in demand." Further, manufacturers of specialized plant have been busy on foreign account. The coal strike and high prices in England and the inability of British manufacturers to quote fixed prices and deliveries have resulted in orders being placed in Germany for locomotives, oil mills, rolling mills and electrical plant. A perusal of company reports shows that good dividends are being paid. The German market is very receptive for foreign orders, and every effort is made to meet the requirements of customers.

Nor does Germany's activity in iron and steel production and in every branch of engineering preclude her from carrying out research work, for she is said to have recently brought out a new alloy styled "electron," suitable for light castings; it is said to have a tensile strength of 12 kg. to 15 kg. per square millimeter (7.6 tons to 9.5 tons per square inch), with an elongation of 3 to 4 per cent. Among the non-ferrous metals, copper, lead, nickel and tin markets are said to have re-established themselves as nearly as possible on previous lines, while zinc interests are expectant in regard to future developments in Australian supplies.

Germany, as stated above, is admirably situated for the economic generation of electric current owing to the large resources of brown coal. She utilizes the brown coal on the spot for the generation of current and her overland power transmission schemes went hand in hand with the development of her war industries. These favorable conditions will play an important part in the further economic development of the country. In point of fact, it may be said that, in combination with her activity and also with the concentrated effort which proceeds from the pooling of interests and of experience on the part of manufacturers German trade is again rapidly coming to the front, and the term "German trade" includes not only the industries briefly referred to above, but also the dye and other chemical and various industries at which Germany appears now to be working with extraordinary energy.

As stated in the commencement of this article, the Miners' International Federation met in London last week. Among the foreign delegates present were Messrs. Hussemann and Hue, for Germany. The official statement issued after the last meeting pointed to the fact that stocks of coal to the extent of 900,000 tons in the Ruhr and 300,000 tons in Upper Silesia, had now accumulated, and added that transport facilities should be improved and overtime in the mines suppressed, etc. The preceding meeting unanimously resolved that "the socialisation of the mining industry in every country was of supreme importance," and "it called upon the workers to redouble their activities in favor of the exploitation of mines by the community." The figures above given by the German labor delegates point to the abundance of coal in Germany; in regard to transport, conditions are better now than they were and are sure to improve still if Germany only wills it. In the matter of socialisation, the British report says: "If any proposal is placed before the German working man which will safeguard him and his family from the worst effects of unemployment and will insure for him a modicum of comfort, he is likely to accept it, and not to bother much about saddling himself with responsibilities of administration. He has had time to learn since the revolution that it is possible to possess authority and yet be very badly off; now he will probably be more eager to obtain rather the substance of a steady employment and wages than the shadow of a position which he is unable to fill. As long as the considerable privileges which labor has already acquired for itself are confirmed, it seems probable that it will arrive at a compromise with the employers on the question of socialisation, and that the latter may be settled without the political and industrial disturbances which were at first anticipated. As far as German labor is concerned, therefore, British labor would seem to be "preaching in the desert." German labor has benefited directly and indirectly by our coal strike, and would most probably view further strikes in this country with the greatest satisfaction.

With regard more particularly to the book by Mr. Lévy, and very briefly, the French writer says that Mr. Keynes appears to object mostly to the clauses of the Treaty of Versailles "which transfer intolerable financial burdens from the shoulders of the victors to those of the vanquished." Mr. Lévy fails to see why the latter should have better treatment than the former; he, further, refutes Mr. Keynes' low evaluation of the damage caused by Germany in Northern France. He also points out how, shortly

before the war, German statesmen, bankers and economists extolled the richness of their country and its marvellous development, how the German works were second only to those of the United States, etc. He gives an abstract of the *étude* published in 1913 by Dr. Helfferich—former director of the Deutsche Bank, also former Minister of the Interior and Minister of Finances, in which this German expert dealt in detail with the great wealth of Germany as a whole. Mr. Lévy also states that the German iron and steel works were running at the date on which he wrote his book—a few months ago—at almost the two-thirds of their former capacity, while the French were running at only a quarter of theirs, and he has the impression that the German people as a whole are conspiring to maintain silence in regard to their output in order to move foreign nations to pity. That is also most decidedly our own conviction. Further, how there can be found men to assert that Germany should be treated kindly at the expense of the Allies passes conception.—*Engineering*, Feb. 4, 1921.

THE GERMAN 380-MM. 45 CAL. NAVAL RAILWAY GUN.—General Features.—The 380-mm. naval gun recoils in a cradle which is mounted on a girder-carriage of heavy plating and angle irons, reinforced and braced, the whole resting on two platforms of which the forward one rests in turn on two trucks of five axles each and the rear one on two trucks of four axles each.

PRINCIPAL CHARACTERISTICS

Total length of the tube.....	17.1 m. or 45 cals.
Length of rifling.....	14.0 m. or 37 cals.
Length of powder chamber.....	2.12 m.
Total weight on rails including trucks.....	270,000 kgs.
Distance between pivot centers of rear trucks.....	5.35 m.
Distance between pivot centers of forward trucks	6.70 m.
Distance between platform pivot centers.....	21.15 m.
Wheel-base (extreme front and rear axles)....	31.618 m.
Mean load per axle.....	15 tons (1 ton = 1000 kgs.)
Mean length of recoil.....	1250 mm.
Horizontal angle of fire on trucks.....	2°
Maximum angle of elevation on trucks.....	17°
Maximum angle of elevation on platform.....	55°
Type of gun.....	Max. No. 52.

The Gun.—The gun (No. 33) is of steel, made by Krupp's in 1916, weighs 77,522 kgs., and consists of a tube, jacket, and hoops. The forward hoop is out of place on the tube by 10 mm.; the breech hoop has two splays or lugs to which are affixed the recoil piston rods. A yoke joins these rods to the counter recoil piston rod which is between them, the machined upper surfaces of the flanges of the counter recoil cylinder casing forming the bearing surface on which the gun slides into the cradle. The breech closing wedge has rapid translatory motion by virtue of a long pitched roller screw, and opens to the left. The block has a bracket for the electrical firing device (which bears the inscription: 2.5 amps, 16 ohms, 1200 coil turns). The block (or wedge) weighs 2580 kgs., has a forked ejector and consists of two parts, one of which has a safety lug preventing closure of the breech before the gun is properly loaded. The powder chamber, having a length of 425 mm., is joined to the bore by a centering slope at whose forward end the rifling commences. The lands number 100 and are of progressive pitch. The rifling is to the right. At the beginning (forcing cone end) of the rifling there is marked erosion of about 1.1 m. in length. In travel, the tube is held in the cradle by two heavy couplings.

Cradle.—The gun recoils in a cradle of cast steel which has a trunnion on either side resting in trunnion beds on the girders. At the rear end can be seen the pneumatic counter recoil cylinder between the two recoil cylinders.

Elevation is effected by means of four hand crank levers, two on either side of the carriage. These crank levers actuate two transversal shafts which are linked by sprocket chain to each other. On the right side of the cradle an arc graduated from 0° to 55° is affixed. The graduations are subdivided into mils. ($1^{\circ} = 16$ mils.).

Trunnions.—Two strong trunnions are supported in cast steel trunnion beds or collars and appear during laying of the piece to rest on two small axles forming a roller bearing.

By appropriate means these rollers bear on a solid casting having uniform power of resistance, and they receive the weight of the gun from cast steel collars affixed to the trunnions by heavy set screws. These collars are flanged outwardly thus concealing part of the perimeters of the rollers. The latter (the rollers) have a diameter of 35 mm. At the instant of firing a lever or beam controlling the uniform bearing on the rollers and having a screw adjustment, probably yields sufficiently to permit the trunnions to bear directly on the trunnion beds. Dismounting the piece not being permitted, it is not possible to give a more definite description of the trunnions.

Recoil and Counter Recoil Mechanism.—The recoil cylinders contain perglycerine and the counter recoil is pneumatic. Diameter of recoil piston rods is 160 mm. Diameter of counter recoil piston rod is 500 mm. A gauge located toward the rear and on top of the cradle gives the reading of the interior pressure of the cylinders. (Hydraulic manometer, graduated from 0 to 250 atmospheres.)

On the rear head of the counter recoil cylinder there are a charging and a discharging valve, above, there is a safety blow-off, and below, an ajutage bearing the number 45. An inscription (metal plate) shows the capacity (Full: 132 liters), and the mean recoil as 1.25 m.

The Girder Carriage.—The carriage consists of two girders made of heavy plating, angle irons, and bracing, bolted and joined together by transoms. On the upper surfaces are fastened cast steel trunnion beds. To the rear of the trunnion bed on the left hand girder the panoramic sight bracket is fastened, also a hand pump, a case for the sights, and a winch for hoisting projectiles in firing from a platform. A level-arm slide giving the angle of sight by means of the half circle fixed to the cradle, a sight case, and a winch serving the same purpose as the other, are all located on the right girder. The carriage is prolonged to the rear by an iron foot bridge, the two being made rigid by two strong supports and two cables tightened by turnbuckles. A supporting bracket having a roller bearing and moving on a suitable roller path on the rear truck upholds the overhang of the foot bridge. The shot truck travels on rails along the foot bridge.

An arched beam bolted to either side of the carriage probably serves to effect the transfer of the projectile from the feeder shot truck to the loading truck, the block and fall suspended from the arch being operated by means of the two winches mentioned above.

The carriage is supported fore and aft by two heavy platforms which in turn are supported respectively by the two forward trucks and two rear trucks. The forward end of the carriage has limited lateral motion across the forward platform so as to permit of laying the piece in direction in firing from the trucks. The maximum motion is 1 degree to either side of the longitudinal axis of the carriage, a graduated arc and index enabling off-sets to read to mils. This motion may be made in either of two speeds (low and high) by two cranks and a set of gears fixed to the forward platform. The cranks turn a screw which engages in a rack attached to the carriage. Two inaccessible fly wheels located between the

two forward trucks appear to damp any movement of the carriage on the forward platform.

Trucks.—The two forward trucks have five axles each. Extreme wheel base (of one truck) 5.12 m. Three of the axles are braked: the middle and the two outer ones.

The weight supporting springs, except for the middle axle, are joined by an equalizing beam. Before firing, screw bolts which are raised in travel are screwed down thus taking the weight off the springs, the shock of discharge, therefore being borne directly by the axle boxes. On the right of the axle boxes of the middle axle the screw bolts are replaced by a buffer box.

The wheels of the first forward truck have a diameter of 950 mm. Those of the second forward truck have a diameter of 940 mm. These two trucks resemble those of the 280 mm. German Railway Gun. The distance from pintle center to pintle center of the forward trucks is 6.70 m., and of the rear trucks is 5.35 m.

The two rear trucks have four axles each. Maximum wheel base is 3.75 m. All axles are fitted with supporting springs and all have the shock transmitting screw bolts. These trucks resemble those of the 240 mm. German Railway Gun.

Mean weight per axle in travel is 15 tons (approx.).

Mean weight per axle in firing is 30 tons.

Minimum radius of curvature for travel is 100 m.

Minimum radius of curved epi for firing is 180 m.

This matériel is of international standard gauge.

—*Journal of the U. S. Artillery*, Feb., 1921.

GREAT BRITAIN

THE NAVY IN THE PACIFIC.—There appear to be no grounds for attributing particular significance to the meeting which is about to take place at Singapore between the commanders-in-chief on the Australia, China, and East Indies stations. Meetings of this kind took place on several occasions during the pre-war period, in accordance with the rule laid down by Lord Fisher soon after he became First Sea Lord in 1904. He chose Singapore as a convenient rendezvous for the China, Australia, and East Indies squadrons and as a base for their use when they combined to carry out joint exercises as the Eastern fleet. The first reports of the forthcoming meeting indicated that the senior officers of the South African, Canadian, and New Zealand commands would also be present, but this turns out to be incorrect. The Singapore conference must therefore be considered simply as a revival of the former practice which naturally fell into abeyance during the war. The value of such conferences is self-evident. They afford the commanders of oversea squadrons an opportunity of foregathering at intervals to exchange ideas and discuss topics of common interest, among which the strategical problems likely to arise in certain eventualities are not the least important. There is no doubt that, were a crisis to occur in the East or the Far East, the Royal Australian Navy, the China Squadron, and the East Indies Squadron would coalesce into one fleet under a single command, and it is therefore essential that the closest possible touch be at all times maintained between these units. From the circumstances that the *Brisbane* is to be the only R. A. N. ship present it is evident that on this occasion no joint maneuvers or exercises are contemplated. But the fact that such a meeting is to take place at all shows that British naval policy, no longer fettered by commitments in the home seas, is in process of readjustment to conform with the new requirements of the world-wide strategical situation.

Although the Imperial naval forces that are immediately available in the Pacific are small by comparison with the other fleets stationed in that

area, they are by no means negligible, and once united they should be capable of holding their own until the arrival of reinforcements. The Royal Australian Navy was partially demobilized last autumn, but the ships that were paid off are kept in good condition, and, according to official statements, could be manned and made ready for active service at short notice. Leaving out obsolete ships and auxiliaries, the Australian fleet unit comprises one battle-cruiser, four fast light cruisers, 12 destroyers, and six ocean-going submarines. While the battle-cruiser is not of the latest design, her relative value would be high in the Pacific, where at present the number of ships of this type is strictly limited. On the China Station we have five fast light cruisers and 12 of the latest submarines, and in the East Indies there are two light cruisers—excluding the *Highflyer*, which is quite obsolete and ought never to have been recommissioned. In case of need, therefore, we could assemble in the Pacific an Imperial squadron consisting of a battle-cruiser, 11 light cruisers, and 18 submarines—a force which no prospective enemy could afford to ignore. Canada is not yet in a position to make any substantial contribution to the Eastern fleet, nor is she well situated geographically to take part in naval operations in the western Pacific. She is, nevertheless, vitally interested in the maintenance of the balance of power in that ocean, and there is no doubt that her future naval policy will be guided mainly by this consideration.

It is impossible to dissociate either American or Japanese naval expansion from the strategical problems of the future. Not that there is any serious prospect of our coming to blows with one or other of these nations, but simply because they happen to be the leading Powers in an ocean where British interests are very great. The United States, which recently deemed it expedient to transfer half her battle fleet from the Atlantic to the Pacific, would not be likely to complain if it were decided gradually to build up a powerful British fleet with its cruising ground in or adjacent to Australian waters, nor would Japan misconstrue the taking of any reasonable precautions to safeguard our interests overseas. As regards the United States, it is to be hoped that people in that country have taken due note of the very important statement made in the *Japanese Diet* last week. On being asked whether Great Britain considered herself exempt from the obligation to assist Japan in the event of a war with America, Count Uchida, the Foreign Minister, replied that the United States was never regarded as a country to which the Anglo-Japanese Alliance applied. Japan, he added, did not interpret the alliance to include England in a Japanese-American conflict. This declaration, superfluous as it may seem from our point of view, should do something to remove the chief obstacle which stands in the way of an Anglo-American naval understanding, for *The Times* correspondent in Washington assures us that "it is Britain's relationship to Japan which in the last resort will determine American policy as to relative naval strength" with this country. Failing an agreement with America it is difficult to see how we are to avoid the alternative of reinforcing the fleet in the East and elsewhere on a scale commensurate with our vast maritime interests.—*The Naval and Military Record*, Feb. 16, 1921.

"THE FUTURE OF THE BATTLE FLEET."—*Foreword*.—These speculations are conceived from the point of view of the British Commonwealth; such procedure is perhaps less impressive than would have been treatment of the subject from an abstract standpoint, but it seems to have the merit of being more practical.

War is such a very practical business that in writing about it we should be practical, that is to say, simple.

For example, except after a full stop, war should not be written with a capital "W," nor should it be hinted that there is a dark, profound mystery in the business, which can be illuminated and plumbed by catch phrases and sentences torn from Clausewitz's context, or other standard works.

To write in this manner is to suggest that there is a War Students' Trades Union, whose secrets will sometimes be partially revealed to the outsider.

War only differs from other enterprises undertaken by man in that the issues at stake are more tremendous and dramatic than those depending on the outcome of most transactions of peace.

Part I.—In April, 1917, the British Empire was perilously close to defeat owing to the sinking of world tonnage by the German U-boats. In this fact lies the greatest of the many lessons to be learnt from the last war.

It will be suggested in these pages that if we mean to profit by this lesson, we must revise our present attitude towards naval warfare and adopt what will seem to be a new attitude, but is in reality very old; we must rid ourselves of many comfortable theories and look into some uncomfortable facts; we must be prepared to find that our ideas as to the composition of a fleet are in error, and that we have spent millions of pounds on a tool which is only capable of doing half the work which may be necessary in war.

These statements, if correct, are disturbing; but in a business, if a mistake is made it often pays to cut losses without waste of time.

Preparation for war and war is a business.

During the past centuries English opinion has almost continuously believed in the doctrine that the immediate purpose of the fleet is to destroy the enemy's armed ships.¹

There has been, and may be still, a school of thought who argue that the navy can efficiently fulfil its task without destroying the enemy fleet in battle, but this opinion has not been that of the majority.

It will seem strange to a historian a hundred years hence, that though the evidence shows that the British fleet from 1600-1920 was brought up on the theory that its main business was to destroy the enemy in battle, yet for months on end between 1803-1805 and 1914-1918 (to mention only two periods) the fleet could not translate its theory into practice. Our imaginary historian (probably a learned civilian) may write rather pompously:

"From the middle ages until the close of the Great War practice gradually became divorced from theory. At the conclusion of the Great War a deep impression was created as a result of the nearness to defeat in 1917 of the old British Empire. It was realized that practice must be re-introduced to theory before the next war, and close attention was paid to the scanty records of naval warfare in the pre-Christian era and all examples of later date in which, as at Copenhagen, a fleet destroyed its opponent notwithstanding all obstacles."

* * *

It is important to establish why the navy was not able to put its theory into practice for long periods during 1803-5 and 1914-18.

The answer is simple. The enemy fleet sat in the fortified harbors of Brest and the Elbe River.

Were these sufficient reasons to prevent us attacking them?

According to our theory they were not, but in practice they were. The truth was that the British fleet was *not designed* to destroy the enemy fleet in battle, either in 1803 or in 1914. It was designed to destroy the enemy fleet in battle *at sea*. It was a one-handed fleet, instead of being ambidextrous. This is no new discovery. Our great-grandfathers, leading a life during Cornwallis' blockade off Brest compared to which Scapa Flow was a bed of roses, longed to get at the French fleet.

¹ The writer's belief in this well-flogged question is as follows: "Object of the navy to control sea communications, therefore it follows that the immediate ideal should be destruction of enemy forces, for when they are utterly destroyed, most of our fleet can go on leave; the control of sea communications being carried out by Ministry of Shipping and Foreign Office."

We find Captain Puget (the original author I suspect to have been that dare-devil, Lieut. Ussher), writing to Cornwallis on June 23, 1804, and enclosing his plan for attacking the French fleet in Brest. Cornwallie passes it on privately to Lord Melville, who on July 10 replies:

"The national advantages attending its success are too obvious to require illustration."

Cornwallis to Melville on September 11 writes:

"It is a daring service, but I have always been of the opinion that much might be done by surprise, and I have formerly thought that our ships, though superior to all the world at sea, were not always so secure at anchor."

For reasons which are not all very clear, except that amongst other causes was the fact that the naval members of the board threw cold water on the enterprise, the project was abandoned on the eve of execution.

One can imagine Captain Puget, sick at heart with the prospect of another winter's work off Brest, when he wrote to Cornwallis on September 23, 1804:

"Sir—The presentation of plans to you lately for harassing the enemy have been so frequent that I have been deterred submitting the enclosed."

There is an echo of what must at this time have largely occupied the minds of the officers in Cornwallis' fleet, in a letter from the Mediterranean, written on December 30, 1804. Nelson writing to Cornwallis, said:

"We could always beat a Frenchman if we fought him long enough: that the difficulty of getting at them was oftentimes more people's own fancy than from the difficulty of the undertaking: that people did not know what they could do till they tried, and that it was always to err on the right side to fight."

Before passing to 1914-18 it is of interest to note that it was fully recognized in 1804 that the seagoing fleet was unsuited for this task of harbor battle.

Almost apologetically does Captain Puget ask for special material; he emphasizes the small quantity he will require, but he states plainly to Cornwallis in his opening letter of June 23:

"As the success of this enterprise must principally depend on equipment and fitting these vessels (special fire-brigs) . . ."

There is also mention in a letter to Cornwallis from Admiral Young at Plymouth, of special grappnels, the parts of which were made by different men in order to ensure secrecy.

More than a hundred years later we come across certain young officers putting forward startling schemes to attack the High Seas fleet in Schillig Roads with fast motor boats and torpedoes.

The main idea of the scheme never materializes, but the idea of the motor boat becomes the C.M.B. and does useful work in 1918 at the small harbor battles of Zeebrugge and Ostend.

From these episodes, a hundred years apart, two conclusions can be drawn.

In the first instance it seems as if in each great war there was an underlying feeling that somehow or other it was wrong just to sit and wait for the enemy to come to sea. If he would not come out, then we must go in; that summed up the matter. But in each instance one has the impression that these disciples of the harbor-attack doctrine did not carry enough weight to impress their ideas on the men who directed British naval strategy. Perhaps they would have been better at forcing their way into Brest or into Schillig Roads than they were at stating their arguments. Why the attacks did not materialize is of secondary importance; it is sufficient for our present purpose to note that this feeling something should be done to get at the enemy fleet has been latent in the navy.

The second conclusion which can be drawn is that special material is required.

In 1804 it was a special type of fire-brig, with grapnels (specially made), etc.

In 1914-15 it was a special form of motor boat with special arrangements for carrying and discharging a torpedo.

Nowhere do we find a hint that the main battle fleet itself could do anything save wait in a hopeful attitude.

At the risk of becoming monotonous I want to repeat again that the battle fleets of 18th, 19th and 20th centuries were designed and trained "To seek out and destroy the enemy; but *only when he was at sea*." A man of genius rose superior to this limitation at Copenhagen and to a lesser degree at the Nile, but no genius could have taken the Grand Fleet into Wilhelmshafen in the last war and returned.

* * *

I propose leaving the first thread of my argument at the point it has reached in the preceding paragraph and picking up the second at its beginning.

Lord Melville said of the first Brest proposal:

"The national advantages attending its success are too obvious to require illustration."

Let us speculate.

In 1804 England was experiencing the sensation that she was face to face with a great crisis in her history; we know the feeling, we had it in March and April, 1918. I feel pretty certain the government had it in April, 1917,¹ though the censorship veiled it from the people on that occasion.

In the autumn of 1804, Napoleon's great invasion plan seemed nearly ripe to bursting point. Nelson, Cochrane, Cornwallis, and Lord Keith kept anxious watch from Toulon to Boulogne.

If the October 8 coaches had carried the news through England that on October 1 the gallant Osborne and Puget with 153 men had destroyed the French fleet in Brest (and it must be remembered that the men on the spot from Cornwallis downward believed it could be done), the country would have breathed one huge sigh of relief.

Napoleon's letter to Decrès in such circumstances would have been worth reading!

Yes, it would have been a notable day and perhaps changed the history of the world and saved Nelson's life; but by no stretch of imagination can we say that upon it depended, or even seemed to depend, the fate of England.

Change the scenery and raise the curtain at No. 10, Downing Street. Time: April-May-June, 1917. But first a few stage directions. England, the keystone of the Imperial arch, is, with the possible exception of Japan, the only country in the world which depends for the continued existence of its inhabitants upon food brought across seas.

The empire is at war, these islands have become its chief arsenal, and the raw material which modern war consumes so greedily, must also come across the seas.

Tonnage is being sunk by U-boats at a greater rate than it is being replaced.

Expert jugglers with figures have proved that if the rate of decrease is not diminished, the minimum figure will be reached on September 1, 1917. They have neglected the morale factor; so let us suppose October 1 to be the ultimate date upon which we shall be faced with the problem of making 2 plus 1 equal 4. Dramatis Personæ: The Cabinet; The Admiralty.

The Cabinet.—Here is the situation: The fate of the empire depends upon your success in reducing the rate of sinking. What can you do?

The Admiralty.—The solution lies in sinking more U-boats. There are two alternative methods of achieving this:

¹ "The Victory at Sea," Chap. I, by Admiral Sims.

(1) The rate of U-boat destruction could be increased on the high seas if we had more destroyers, more U-boats, more submarines; in shore, more material.

(2) It could be increased were we able to employ the material we have got, close up to the exits from which the U-boats proceed on to the British lines of communication.

The first method, which we are now engaged upon, is bad strategy, for our forces are dispersed; the second method, were it possible, would be good strategy.

The Cabinet.—Why cannot the second method be employed?

The Admiralty.—Because our light craft cannot work off the German bases, since in those ports lie the High Seas fleet. Our craft might be able to work there for a few days supported by the Grand fleet, but we want to work there for several months.¹

The Cabinet.—Since your first method of increasing the rate of destruction of U-boats demands time and more material—two things we cannot produce—we are obliged to fall back on the second method, which seems to demand as an essential preliminary the destruction of the High Seas fleet.

The Admiralty.—That is so.

The Cabinet.—Can the Grand fleet do it?

The Admiralty.—If the army cannot turn the German right flank and take the German coast line in rear, and if the Cabinet's opinion is that it is a case of neck or nothing, then the Grand fleet will seek out and endeavor to destroy the High Seas fleet. But success is doubtful, since the Grand fleet is neither designed nor trained to do this work.

* * *

The above phantasy very nearly became an unpleasant reality; there can be no doubt that we might have had to destroy the High Seas fleet to save our empire; and it is equally certain that our material was quite unsuited for the purpose.

What of the future? Are we likely to be faced with the same problem?

In 1914 there was a comfortable saying: it ran something like this, "*guerre de course*, or war on trade, can never win a war." It was not accurate, for the English forced the Dutch to their knees in the 17th century by cutting off the sea trade on which the Dutchmen lived; nevertheless, it was a comfortable saying in the ears of Englishmen who depended for their existence on overseas communications.

The exploits of the *Emden* shook it a little, but it perked up on remembering that "we lost more trade ships after Trafalgar than before, and still we won that war."

In February, 1915, the German system of U-boat *guerre de course* made its début.

The "saying" fell into a decline, and by April, 1917,² it was dead; heaven forbid that because we won the last war there should be a resurrection.

"War on trade can win a war against England to-day." Why was it then that the French in the 18th and early 19th century failed to make it do so whilst the Germans in the 20th century almost succeeded, and possibly only failed because they did not allow Tirpitz to have his way?

¹ "The German fleet was the bulwark behind which the U-boat campaign grew up." (From a report of a speech by Admiral Lord Beatty at Liverpool.)

"The function of the High Seas fleet is to secure the U-boat bases and the approaches thereto." (Said by the captain of a U-boat to the writer in February, 1918.)

² In this month the U-boats sank 875,023 tons of shipping.

The situation in the 20th century differed from its predecessor in several important particulars. In the first place, the British islands have during the last 100 years rapidly become highly industrialized, and therefore more dependent for food and raw material on oversea supply. In the second place, Germany employed submarine cruisers which were not only harder to cope with than surface ships, but enjoyed the advantage of operating against our trade, while we were still busily experimenting in endeavors to discover methods by which under-water craft could be located and destroyed.

Modern practical submarine work dates from 1907; a similar point in anti-submarine effort was not reached until 1917. These ten years made a big difference, and we have every reason to be proud of the rapidity with which we recovered some of the lost years. If we take the figure 100 to represent either the tonnage, or the food and materials, which normally come to the British Islands in a year, experts can calculate what percentage of this figure would suffice as a bare minimum on which to feed the people in peace, or feed the people and supply the armies in a given war. The value of this percentage has unquestionably increased greatly during the last century.

In 1805 it may have been as low as 30 per cent, that is to say, we could have lost 70 per cent of our imports and still continued the war. In 1917 it was probably in the region of 60 per cent. There seems no reason to suppose that in the future it will get less, everything points to it rising. In any event there is no doubt that a certain *factor of safety* does exist, and that if our enemies can reduce our volume of sea imports below this figure we cannot continue the war.

Without guessing at actual figures, whose precise numerical value does not affect the argument, let us assume that in April, 1917, the factor of safety was "X." Then at that moment the strength of the structure was actually X plus DX, where DX was a diminishing quantity which the U-boats seemed likely to be in a fair way to eliminating within a few months. Of course they did not eliminate it; we pulled through, and in 1918 "DX" was a little bigger than "DX" had been in 1917. This fortunate circumstance was at least as much due to the hampering effects of politics on the *U-boat* war as it was to anti-submarine efforts, though the latter were very fine. In the future we cannot bank on enemy politics helping us.

* * *

I have tried to show in the preceding pages:

That though the British fleet exists for the purpose of destroying the enemy's fleet, it can only do so in the special case of the enemy fleet at sea.

That this fact has been felt to be a weakness in the past, and that efforts to remedy it all depend upon the addition of special material (and training) to the fleet.

That this addition has not been made in peace time.

That whereas in the Napoleonic wars the destruction of the enemy fleet in its base may be described as being then a desirable luxury, in the late war it nearly became an imperative necessity, and that in a future war it may become an imperative necessity.

That if the above conclusions are sound, they lead to the decision that the safety of the Empire demands a fleet which can insure the destruction of the enemy's main forces *wherever they may be*.

The possible lines of development which, if followed, would lead to such a fleet are considered in the second part of this paper.

Part II.—The problem to be solved is as follows.

"The enemy fleet is in a heavily fortified base; the destruction of that fleet is necessary in order to win the war."

Ignoring combined operations, which are outside the scope of this paper, a solution can be sought in two ways. Either we can attempt to destroy

the enemy in his base, or we can attempt to make him come to sea and accept battle with our seagoing fleet.

To destroy an enemy in a strong base can never be impossible, but its achievement may demand such expenditure on special material that it becomes uneconomic.

No doubt naval constructors could give us a fleet of curious, slow-moving, torpedo-proof, mine-proof, gas-tight, 40-inch armored, net-cutting, submersible monsters, capable of penetrating anything except a breakwater.¹

But they would be built at the expense of the sea fighting fleet; we should still have a one-handed fleet and be no better, probably worse off, than we are at present.

Here we face the first difficulty, which is this: How can we give our present fleet a right-handed punch for use against an enemy in harbor without weakening the straight left it needs if the enemy comes to sea?

We need special material, but we must put forward modest demands. If this principle be agreed upon we are obliged to eliminate:

(i) Any idea of special long-range (100,000 yards) guns mounted in ships unless these guns are going to be equally useful in a sea battle. Their use against a fleet in harbor implies aerial supremacy over that harbor, and the chances are that as we are far from our base and he is at his, the boot will be on the other leg.

(ii) Bombardment from the air: If we intended to employ this method of destroying him, we should have to devote half our naval estimates to aircraft. Half the navy may be in the air in time, but we shall probably be in our graves or club armchairs before that happens.

(iii) The construction of a special fleet of harbor penetrators.

If the above are forbidden fruit, the only alternative, in the writer's mind, is the adaptation of chemical warfare to this naval requirement.

Gas (at present) does not attack material but personnel. In open sea warfare every effort is made to destroy material, since personnel are so tied to their material that the destruction of the ship usually involves that of the men.

In land warfare, the distinction between efforts to destroy material and those to destroy personnel are more widely separated.

The men who invented grape shot, langridge, shrapnel, and the machine gun realized that a very small missile knocked out a man, and that against exposed personnel 16,000 one-ounce missiles gave much better results than one 1000-pound shell, which might break up into a few hundred effective pieces.

The chemist has improved on shrapnel; he has given us gas with its immense number of projectiles in the shape of molecules. The density of the projectiles is such that several square miles can be brought under effective fire. Nothing in that area can hope to be missed by the gas molecules. Though they have a great disadvantage in their slowness of flight, and dependence on the wind, the point to bear in mind at this juncture is that the bedrock of chemical warfare is the immense number of man-killing missiles which can be diffused over large areas.

* * *

The strength of the position of a fleet in a defended base need not be labored, but it has one conspicuous weakness—as long as the fleet stays in that base it has lost mobility.

Naval history is so replete with the difficulties of the problems in which the British fleet has had to find the enemy, that it is evident that the knowledge to within a few miles of the exact position of our objective is a great advantage to us. If the whole problem we are discussing is looked at broadly, this knowledge solves half our difficulty.

¹ The embryo of some such ship was used by the Italians in their attack on Pola, 14th May, 1918. (See R. U. S. I. Journal for May 1919.)

"We know he is in X. Y. Right. At him then!"

How much more encouraging this sounds than:

"We know he was at X. Y. a week ago. Right. Where shall we look for him now?"¹

I suppose our present fleet to be as perfect an instrument for open sea fighting as can be built and trained to-day.

To that fleet I suggest adding a certain number of submarines fitted to discharge gas and a certain number of gas ships. Both submarines and gas ships would carry gas in liquid form. The employment of these vessels would be somewhat as follows:

Method A: The Direct Attack.—The main battle fleet occupies a covering position. The submarines get as close to the base as they can and discharge gas with an onshore wind.² The result will be that every man in the hostile fleet, every soldier in its forts, every workman in its dockyard, every inhabitant in the town (should there be a town) will have to put on a mask. Perhaps our gas beats their mask, perhaps it does not. Take the worst case and suppose the mask to beat the gas. Life in a gas mask becomes monotonous after some hours. I do not think dockyard mates or town councillors would like to spend 12 hours of every day in a gas mask. The C-in-C. might find it rather trying after the tenth day. I believe we could make life so intolerable for that fleet that they would be driven to take the only step which would enable them to avoid the gas, *i. e.*, they'd have to move. They could only move one way, and that way would be to the open sea; we should get our battle.

Method B: The Indirect Attack.—The direct attack has failed; the onshore wind did not come up to expectation, or the gas submarines went up on minefields, or the one thing we never thought of unfortunately turned up, etc. The result is a fresh situation, which is dealt with as follows:

The main fleet moves a few hundred miles down the coast, leaving submarines off the enemy base. It takes up a covering position between the enemy main base and the flourishing commercial port of X. Y. Z.

The gas ships arrive off X. Y. Z.; only half-a-dozen little ships each of 4000 tons, and escorted by suitable light craft.

Six hours' notice to evacuate the town is given (if the enemy has been playing the game at sea), and then the gas squadron gets busy. It would probably be unnecessary to use lethal gas.

Put Liverpool in the position of X. Y. Z. One can imagine the hurried Cabinet meeting, the hasty reversal of naval policy, the telegram insisting on the fleet putting to sea to drive off the gas ships. . . . In the middle of the excitement news is received that two vessels thought to be gas ships have just arrived off the port of P. B. X. . . .

We should get our battle.

Conclusion.—All war problems revolve upon the question of overcoming or maintaining the defensive. In France, in the last war, both armies were up against this question. Looked at from the British side our army knew that until they could break down the German defensive system and destroy, or threaten to destroy, the German Field Army, the war would not be won.

To break down this defensive, two new things were brought into being:

1. Immense artillery power.

2. Mechanical warfare.

The army had to devise, make and test these things in time of war, when every moment was precious.

Though it is true the navy had to improvise the anti-submarine business, it was on the whole more fortunate, in that by the old methods it succeeded

¹ Please forget all about the North Sea, and think of big areas.

² The Sailing Directions afford food for thought in connection with the direction of prevailing winds in various parts of the world.

in doing its share in the war. We may now hope for years of peace; these are the years in which to overhaul our methods.—*Royal United Service Institution*, February, 1921.

TRANSATLANTIC VISITORS.—The American Navy is still doing its bit in "clearing up the mess" which the war has left in the remoter parts of Europe and also in the Near East. The result is that its ships are frequently seen in our ports, and Uncle Sam's naval officers and "Jackies" still contribute a respectable quota to the transient population of our capital. Among the latest visitors to Gravesend were the new "flush-deck" destroyers *Sands* and *Williamson*, and a representative of *The Naval and Military Record* who took the opportunity last week to inspect the former vessel was courteously received by her commanding officer, Commander Ghormley, U. S. N. These flush-deckers have introduced a new fashion in destroyer design. They are big, weatherly ships, and those who sail in them speak enthusiastically of their sea-keeping qualities. The complement averages 110, including eight wardroom officers, and all on board are most comfortably housed. The United States Navy, like our own, has lost a large number of its best and most highly-trained men through demobilization, but if the destroyer crews are a fair sample, the ratings that remain are of excellent quality. It would certainly be difficult to find a cheerier and harder-working ship's company than that of the U. S. S. *Sands*. It is interesting to observe the remarkable difference which the recent modification of uniform has made in the appearance of American naval officers. Now that the single-breasted tunic, with its stiff stock, has given place to a double-breasted reefer very much after the British pattern, it is by no means easy to distinguish American from British N. O.'s at any distance, especially as the former seem to be discarding the mustache which their regulations, contrary to those of our service, permitted them to wear sans beard. The only striking difference in the two uniforms is that the American deck officer wears a star in place of the "executive curl." Nor is the resemblance between the two types limited to outward appearance. An hour's chat with a group of American naval officers leaves one wondering what on earth prevents two nations so much akin in ideals, thought, and temperament from "getting together" and working in double harness. Certainly, if the seafaring element had more voice in affairs on both sides of the Atlantic, reciprocal bickering would speedily give place to frank and cordial cooperation between the two peoples.—*The Naval and Military Record*, Feb. 23, 1921.

THE SHIPPING OUTLOOK.—The February number of *The Navy* contains a most timely and instructive article on "The Principles of Shipping," by Mr. A. M. Pooley, which should bring plenty of comfort to those faint-hearted people who have been sounding the death-knell of British shipping supremacy. Mr. Pooley is under no illusions as to the competition which the Red Ensign now has to face, but he shows very clearly that if we fail in the contest it will be our own fault. He mentions as a fact worth noting that the countries which had made a bid for, and ultimately missed, sea power, generally have their capitals situated inland, cases in point being Berlin, Madrid, Rome, Washington, and Paris. The sequence, although not chronological, is significant enough. He considers that the final element of success in shipping is the attitude of the government. Maritime development is nowadays the aim of many countries, but history teaches us that "silent sympathy" is the best attitude that any government can assume towards this industry. At the present time nearly every government except the British is subsidizing, regulating, or encouraging by other means the activity of its shipping. But, says Mr. Pooley, "a mercantile marine, while it may be legislated into existence, as occurred in the United States during the war, may equally easily be legislated into oblivion, as occurred in the same country before the war," and as may occur again if

Admiral Benson and Senator Jones have their way. "A flourish of trumpets and a vast expenditure cannot alter the course of nature. The attitude of a wise government towards shipping development should be to leave it alone and 'watch the other fellow.' Shipping is a business of natural growth, and any attempt to force its growth is bound, eventually, to meet with disaster. If a government discriminates against foreign ships, there will be international trouble. If it over-develops tonnage other industries must suffer." These be words of wisdom, and, incidentally, of comfort. As a commentary on the alarmist statements about the decline of British shipping which were current all last year, we may quote the latest announcement from Washington, according to which another few hundred vessels of the U. S. Shipping Board are to be withdrawn from service this month and laid up, with very little prospect of ever putting to sea again.—*The Naval and Military Record*, Feb. 9, 1921.

JAPAN

JAPANESE NAVAL POLICY.—Hitherto there has been little enthusiasm in Japan for the "naval holiday" proposals of which so much has been heard elsewhere, but signs are not wanting that the "non possumus" with which every previous suggestion of this nature has been met may soon become less emphatic. It is significant that Mr. Ozaki, a former member of the Cabinet, should have introduced a bill for the partial suspension of the Japanese naval program. The author of the bill was until lately a leading light of the Kensei-Kai, the party which has been most prominently associated with the big navy movement. It is true that a split has just occurred in the ranks of this faction over the suffrage question, in consequence of which Mr. Ozaki has ceased to be a member of it, but his move in favor of naval retrenchment suggests that one of the great political parties of the Empire is no longer throwing the whole weight of its influence into the scale against disarmament. Baron Hayashi, the Japanese Ambassador in London, has assured us that his country has no intention of setting the pace in naval competition. Her present programme is, he insists, a measure of defence natural to an island empire, but he adds that Japan would be only too pleased to join in any discussions between the League of Nations on the disarmament question. That she is unwilling to disarm before an international agreement has been reached is shown by the rejection last week of Mr. Ozaki's bill by a majority of seven to one. Undoubtedly there is a Chauvinist Party in Japan, which enjoys the support of the military caste and of the big industrialists, the latter being anxious to exclude Westerners from the markets and resources of China, while the former regard an aggressive foreign policy as the surest antidote for social troubles. It is but fair to add, however, that some of the most violent outbursts of the Japanese press have been provoked by the menacing tone of the Hearst newspapers in America and the uncompromising attitude of California towards Japanese immigration. It must be obvious to every thoughtful Japanese that his country cannot hope to compete successfully with the United States in naval shipbuilding, and that further efforts in this direction, so far from modifying the balance of power in favor of Japan, are likely to produce the contrary effect by giving a fresh impulse to naval construction in the United States. If only Tokio and Washington could reach an agreement on this subject, world-wide disarmament, or limitation of armaments, would follow as a matter of course.—*The Naval and Military Record*, Feb. 16, 1921.

LAWS TO RELIEVE JAPAN'S POOR.—Critics of Japan who think she has nothing on her mind but thoughts of territorial aggression would do well to consider the complexity of the problems that follow upon her great home expansion during the war, we are advised by some Japanese editors, who point with modest pride to three impressive pieces of legislation now in

process and sure of enactment "possibly with minor modifications." These are the Public Employment Agency Bill, the Home Supply Corporation Bill, and the Slum Improvement Bill. The Public Employment Agency Bill, as *The East and West News* (New York) informs us, aims to establish an efficient national system of employment. Such a government agency has long been contemplated and is now absolutely necessary because of the vast number of unemployed. The bills provides for public employment agencies in cities, towns, and villages throughout the country, which are to be directed by the local authorities. The local directors will receive instructions from the Central Board of Employment, to be established under the direct supervision of the Minister of Home Affairs. The government hopes through this legislation to set in motion an adjustable mechanism for regulating the demand and supply of labor all over Japan.

The Home Supply Corporation Bill is designed to help people obtain homes more easily, and this legislation is said to be imperative because of the fact that rents have mounted by leaps and bounds and the housing famine has become acute. The Tokyo *Yomiuri* tells us that salaried men and laborers must pay "one-third or even one-half of their income for house rent," and even when they are willing to pay so high a rent it is difficult for them to obtain a place to live. *The East and West News* explains that the housing bill is—

"A kind of special corporation law to be applied exclusively for mutually financing associations created for the purpose of building and supplying houses. Such corporations may be formed by a combination of 20 or more people having desire to obtain homes for reasonable sums. Each member shall pay a fixed sum of money for a certain period of time and get a house which he desires.

"The bill contains detailed regulation of the corporation safeguarding against possible fraud to which this kind of organization is susceptible. It is expected that upon the passing of the bill by the Diet the means of obtaining homes will become much more accessible to the lower middle class of people than heretofore."

The Slum Improvement Bill purposes general improvement of the slum districts and also stimulation to local authorities toward systematic campaigns for social settlement work. The operation of this bill will cost the local governments some money and also involves subsidy by the central government, and this informant proceeds:

"There are particular kinds of slums in all large cities of Japan where 'eta' or discriminated class of people live. These people are segregated and detested by the other classes of Japanese, much as the negroes are segregated in some portions of the United States. The reasons for the exclusion are diverse, but the principal one is the historical fact that 'eta' belonged to a profession of killing animals and selling their flesh and hides at the time when Buddhism came in some 1500 years ago. Buddhism condemns killing of living creatures as the blackest of sins. Hence, when the religion was embraced by a large majority of the people, the 'eta' were held as an abominable class. This traditional prejudice became fixed in the minds of the people and clings even to this day.

"Now these segregated people live under an entirely different standard of living from the ordinary Japanese, and constitute the lowest stratum of the society. It is the improvement of this particular class of people and their conditions of living that the bill is especially aimed at. It provides for plans for improving streets and alleys in these quarters, improving houses, establishing better system of sewerage and water supply, extending medical aid, promoting morality and education, and for general betterment of economic status of the people.—*The Literary Digest*, March 12, 1921.

JAPANESE NAVY.—Ever since the last autumn rumors have been afloat in London to the effect that a considerable part of the new naval program

which the Japanese Government adopted in July was to be executed in this country.

Only a fortnight ago a statement appeared, with all the semblance of authority, to the effect that Cammell, Laird & Co. had secured the contract for two battle cruisers, while Vickers & Armstrongs were said to have received orders for other ships of this type. Orders of this kind would, of course, be a perfect godsend at the present time, when British armor plate mills and gun factories, erected at enormous cost, are lying idle and incidentally eating up capital for their maintenance. But, unfortunately, the rumors have not been confirmed, and I am now able to state that they are premature, to say the least.

Captain S. Kobayashi, C. B., the popular Japanese Naval Attaché in London, has been kind enough to furnish me with a statement on the subject, and I cannot do better than quote his remarks.

"It is true," he observed, "that a certain amount of barbette and other special armor plate for certain battleships, together with a quantity of armor-piercing projectiles, have been ordered in England by my government, but so far I have no official information touching the construction of capital ships in this country. As you are no doubt aware, the present world-wide financial depression is felt in Japan, and the shipbuilding firms are experiencing a serious shortage of work; they are, therefore, most keen to secure any orders which may be available. Under these conditions I do not think that the Japanese Government would contemplate placing orders for the building of capital ships in a foreign country.

"It must be remembered, however, that the Japanese shipbuilding firms are still young in experience, and they may find it necessary to have some of the special material supplied from abroad. In this case, therefore, certain Japanese firms may have placed contracts with British firms for some special machinery or engines; but since this is a matter which concerns the Japanese private firms alone, it would be impossible for me to furnish particulars of the orders in question."

Guarded as this statement is, it appears to refute the rumors that battle-cruiser orders have been actually placed in this country. At the same time, there is a possibility that such orders will be forthcoming in the near future, owing to the fact that the Japanese shipbuilding and armament industry is not in a position to deal with the immense amount of construction represented by the new naval programme.

Four battleships and four battle-cruisers, with an aggregate displacement of 241,600 tons, are now under construction in Japanese yards, and eight additional capital ships, of still larger dimensions, have been voted by the Diet. Other construction now in hand or authorized includes 12 to 16 light cruisers and a very large number of destroyers and submarines. The execution of all this work would tax the resources of the most extensive and highly-developed industry, and it is certainly far beyond the capacity of the Japanese firms, in spite of the remarkable strides they have made since 1914.

Moreover, the government appears to be desirous of getting all these ships afloat within the next five or six years, in which case they will have no option but to farm out some of the work to foreign firms, and the high reputation which British shipbuilding enjoys in Japan is a guarantee that in such circumstances our own firms will be given the preference.

So far, however, no orders for ships have been received, though a certain amount of other work is being done there on behalf of the Japanese Navy. Messrs. Vickers, for instances, are manufacturing 7600 tons of special curved armor plate for the barbettes and conning-towers of the battleships *Kaga* and *Tosa*, and are also building several sets of 1200 brake horsepower engines for submarines, the boats themselves being on the stocks in Japan. Messrs. Hadfields are turning out several thousand armor-piercing projectiles for the 14-inch and 16-inch guns of the Japanese battle fleet.

These orders, welcome as they are, appear to be regarded as a promise of better things to come; and if that expectation is fulfilled the problem of what to do with our armor plate and gun-making plants will be solved, at any rate for the time being.

Twenty years ago Great Britain was the main source of supply for the Japanese Navy. Practically the whole of Togo's battle fleet at Tsushima had been built and armed in this country, and as late as 1912 Vickers launched the Japanese battle-cruiser *Kongo*. Since then, however, Japan has been able to meet her own naval requirements, though a certain part of the material and equipment of her later dreadnoughts was imported from Britain.

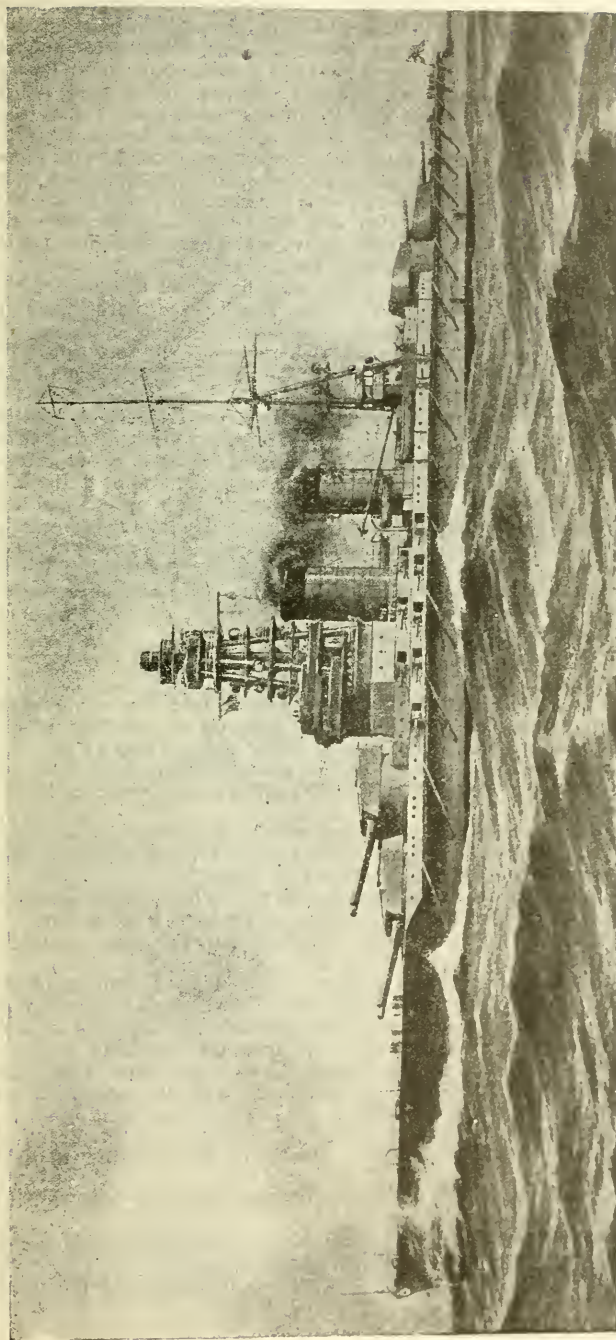
But she has now embarked on a naval programme which goes considerably beyond the resources of her own industry, and if the ambition of Admiral Kato, the Minister of Marine, to have all the new ships in service by 1926 is to be realized, the placing of large contracts abroad will be inevitable. In any case, I am told that British shipbuilders and armament manufacturers are hopeful that enough work will be forthcoming to tide over the difficult period which now confronts them.

It is of interest to learn that the two latest Japanese battleships to be built here, the *Katori* and *Kashima*, both launched in 1905, will sail for England next month. The *Katori* is bringing the Japanese Crown Prince, while her sister ship is to act as escort.—*The Naval and Military Record*, Feb. 9, 1921.

THE LATEST JAPANESE BATTLESHIP "NAGATO."—*The First Japanese Capital Ship to Include the Lessons of the Battle of Jutland*.—In view of the great public interest just now in the navies of the world, particularly in regard to the proposed reduction of armaments, the accompanying wash drawing of the *Nagato*, the latest Japanese battleship to be completed, possesses special interest. Although the modern battleships of all nations have reached a commonly accepted type, and are so generally similar in appearance that it takes a trained eye to recognize their individual silhouettes at a distance, the *Nagato* will be distinguishable at a glance by her remarkable five-legged foremast, with its many superposed platforms and fighting tops or, as they are now called, director stations.

The *Nagato*, which was authorized in the 1916 program and laid down during the summer of 1917, was proceeded with slowly during the war and has only just been completed. She is one of a class of four ships, of which the *Mutsu* is practically completed and the *Kaga* and *Tosa* were begun in January, 1920. The four ships represent the work of Japanese designers and constructors, and the fabrication has been done in Japanese shops and yards. This class of ship invites comparison with the four United States battleships of the *Maryland* class, since they are of similar tonnage and were authorized in the same year. The main armament also is the same, though the speed is higher. Not much is known about the armor plan, and it is a pretty safe guess that because of the higher speed and heavier motive power of the Japanese ships, their defensive qualities are inferior to those of the *Maryland*.

The *Nagato* is 660 feet long between perpendiculars, with a beam of 95 feet and a mean draft of 30 feet. It is probable that since she was built subsequently to the Battle of Jutland, the technical lessons learned in that engagement have been embodied in her construction, as they no doubt have been to a great extent in our own *Maryland* class. This means that particular attention has been paid in the submerged portion of the ship by the incorporation of anti-torpedo devices, though the beam would indicate that the bulge has not been adopted. The belt armor is believed to be not less than 12 inches, and the decks in the wake of the magazines have been strengthened as a protection against plunging fire.



THE LATEST JAPANESE BATTLESHIP "NAGATO."

Length: 660 ft.; *Beam:* 95 ft.; *Mean Draft:* 30 ft.; *Displacement:* 32,000-34,000 tons; *Speed:* 23 knots; *Armor Belt:* 12-inch, with heavy deck armor; *Armament:* eight 16-inch, twenty 5.5-inch; *Torpedo Tubes:* 8.

The armament is very powerful, and this is the first battleship to mount the 16-inch gun, of which the ship carries eight mounted in pairs of turrets forward and aft. The gun is a powerful piece, firing a 2460-pound shell with a velocity of 2500 feet per second and a muzzle energy of 106,000 foot-tons. The shell is considerably heavier than our naval shell, which weighs 2100 pounds, but the high velocity of our naval gun of 2800 feet per second gives it a greater muzzle energy of 112,000 foot-tons. The secondary battery is also very powerful, consisting of 20 5.5-inch guns carried in broadside on the main and spar decks. The 5.5 gun is a new, long-caliber piece, coming midway in power between our own 5-inch and 6-inch guns. The *Nagato* carries also four 12-pounder anti-aircraft guns, and she is credited with the unusually heavy armament of eight 21-inch torpedo tubes; but we doubt that so many are carried.

Japan early adopted the tubular, tripod mast first used by the British; and she seems to like it so well that she has added three more legs until we have the imposing structure which towers above her fore bridge. It consists of a large central mast about which are built four inwardly inclined legs, the whole terminating in a large fighting platform above which are the separate, enclosed director-control stations, one for the main and the other for the secondary armament. A notable feature is the great number of searchlights, which are mounted upon successive platforms both on the fore and main masts and also on the after smokestack—evidence, this, of another lesson learned in the night-fighting at Jutland.

In their later ships, the Japanese have favored high speed, and the *Nagato* and *Mutsu* are reported to be 23-knot ships. The motor power consists of turbines of 46,000 horsepower and the propellers are driven through reduction gearing, a system which seems to be giving full satisfaction in the large powers with which it has been used in the later ships of the British Navy, and notably in the battle-cruiser *Hood*, of 165,000 horsepower.—*The Scientific American*, Feb. 26, 1921.

UNITED STATES

PROBLEMS THAT FACE HARDING.—“Just a few” of the complicated diplomatic problems that Warren G. Harding is facing are listed as follows in a Washington dispatch to the *New York Tribune* (Rep.):

“The Japanese situation growing out of the California land laws, an attempt to smooth over which already has resulted in loud outcries by the California Senators.

“The discussions which representatives of the British dominions have been holding with Senator Lodge as to some plan of these dominions and the United States presenting a united front to Japan.

“The Mexican situation, which apparently the Wilson Administration intends to leave on Harding’s door-step, just as Taft left it on Wilson’s.

“The disarmament proposal, with its important relations to Great Britain and Japan.

“The situation involved in foreign debts to the United States and the interest thereon, about which whole affair either the British Chancellor of the Exchequer is guilty of an extraordinary blunder, or else the Wilson Administration has been concealing the truth from the American people.

“The peremptory demand by the United States that Japan cease from occupying the other half of Saghalien Island and cease the attempt to set up buffer states in the south of Siberia.

“The protest against Britain and France restricting development of natural resources of mandate territory, notably in Mesopotamia, to their own nationals.

“The Cuban situation, which may easily lead at any time to the necessity for intervention.

“The dispute with Japan over American rights, particularly cable rights, in the island of Yap, and also the general cable situation.

“The Chinese situation, involving both the consortium and the open-door policy.

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,
AS REPORTED FEBRUARY 28, 1921

Type, number and name	Contractor	Per cent of completion			
		Mar. 1, 1921		Feb. 1, 1921	
		Total	On ship	Total	On ship
<i>Battleships</i>					
44 California	Mare Island Navy Yard.....	95.8	95.2	95.5	94.7
45 Colorado.....	New York S. B. Cpn.....	68.	65.	66.7	62.6
46 Maryland.....	Newport News S. B. & D. D. Co.....	95.	94.3	93.	92.2
47 Washington	New York S. B. Cpn.....	59.5	52.1	57.6	49.8
48 West Virginia.....	Newport News S. B. & D. D. Co.....	47.	36.3	44.5	33.2
49 South Dakota.....	New York Navy Yard.....	26.	17.2	22.3	13.5
50 Indiana.....	New York Navy Yard.....	21.4	12.6	18.2	9.4
51 Montana.....	Mare Island Navy Yard.....	17.5	10.7	16.6	9.5
52 North Carolina.....	Norfolk Navy Yard.....	24.1	16.1	21.8	13.4
53 Iowa.....	Newport News S. B. & D. D. Co.....	14.1	10.5	13.1	9.2
54 Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	2.	....	1.2	....
<i>Battle Cruisers</i>					
1 Lexington	Beth. S. B. Cpn. (Fore River)..	10.6	2.3	7.7	1.1
2 Constellation	Newport News S. B. & D. D. Co.....	6.5	3.8	5.1	2.7
3 Saratoga	New York S. B. Cpn.....	16.	8.	13.3	6.6
4 Ranger.....	Newport News S. B. & D. D. Co.....	1.1	.5	1.	.4
5 Constitution.....	Philadelphia Navy Yard.....	3.	1.2	2.3	.8
6 United States.....	Philadelphia Navy Yard.....	3.	1.2	2.3	.8
<i>Scout Cruisers</i>					
4 Omaha.....	Todd D. D. & Const. Cpn.....	88.4	80.7	88.4	80.1
5 Milwaukee.....	Todd D. D. & Const. Cpn.....	81.6	74.	79.	72.7
6 Cincinnati.....	Todd D. D. & Const. Cpn.....	73.4	60.9	64.2	54.2
7 Raleigh	Beth. S. B. Cpn. (Fore River)..	47.5	30.6	42.2	26.3
8 Detroit.....	Beth. S. B. Cpn. (Fore River)..	47.4	30.5	41.9	26.
* 9 Richmond.....	Wm. Cramp & Sons Co.....	60.	....	59.	....
*10 Concord.....	Wm. Cramp & Sons Co.....	59.	....	58.	....
*11 Trenton.....	Wm. Cramp & Sons Co.....	40.	....	39.	....
*12 Marblehead.....	Wm. Cramp & Sons Co.....	38.	....	37.	....
*13 Memphis.....	Wm. Cramp & Sons Co.....	31.	....	30.	....
<i>Auxiliaries</i>					
Fuel Ship No. 18, Pecos.....	Boston Navy Yard (Oiler AO 6)	67.4	65.4	59.	57.
Ammunition Ship No. 2, Nitro (AE 2).....	Puget Sound Navy Yard.....	99.9	99.5	99.8	99.2
Repair Ship No. 1, Medusa (AR 1).....	Puget Sound Navy Yard.....	55.5	38.4	51.6	36.6
Dest. Tender No. 3, Dobbin (AD 3).....	Philadelphia Navy Yard.....	50.3	50.	49.3	49.
Dest. Tender No. 4, Whitney (AD 4).....	Boston Navy Yard.....	17.6	6.	15.	4.4
Sub. Tender No. 3, Holland (AS 3).....	Puget Sound Navy Yard.....	9.5	....	7.8	....
Aircraft Tender, Wright (AZ 1).....	Tietjen & Lang.....	48.	....	38.	....
<i>Patrol Vessels</i>					
Gunboat No. 22, Tulsa (PG 22).	Charleston Navy Yard.....	55.	39.	49.9	35.9

* Completion dates indefinite on account of strike.

In addition to the above there are under construction 21 destroyers and 38 submarines.

Authorized but not under construction or contract 12 destroyers, 7 submarines and 1 transport.

There were delivered to the Navy Department during February, 1921, 7 destroyers and 3 submarines.

Work on all destroyers and submarines (except submarines V-1, V-2 and V-3) is more than 50 per cent complete.

"The Turkish-Armenian dispute, which Wilson has declared involves the whole question of attacks by small states encouraged by larger ones on Russia.

"The problem about Russian trade and recognition of Soviet Russia.

"The Irish situation.

"Panama Canal tolls, involving, if it is raised, as Mr. Harding promised, the reopening of the dispute with Britain over the construction of the Hay-Pauncefote treaty.

"The problem presented by American occupation or control of Hayti and other small Latin-American states.

"The dispute with Costa Rica over the purchase of the option on the Nicaragua Canal route, and with Salvador and Honduras over the American purchase of a naval base in Fonseca Bay, both disputes being involved in the Nicaraguan treaty.

"The Colombian treaty dispute, under which a treaty for the payment of \$25,000,000 for alleged injuries in the Panama revolution is still pending.

"The question of American interest in the fixing of German indemnities.

"These are just a few of the problems, and do not touch on the biggest one of all, the question of an association of nations, to take the place of the League of Nations, except in that they complicate it and make it much more difficult of accomplishment."—*The Literary Digest*, Mar. 5, 1921.

EXCHANGING EDUCATIONAL FACILITIES WITH MEXICO.—The "Greaser" and the "Gringo" will perhaps look for more complimentary names for each other in the not distant future. If education succeeds where war and threats of war, with border raids as incidentals, fail to make two peoples friendly, Mexico and these United States may yet come to live in harmony. Business interests represented by various Chambers of Commerce, Rotary Clubs, and Foreign Trade Bureaus are furthering the proposal to establish exchange scholarships to "promote the exchange of educational opportunities between the two countries for deserving young men in college and university, commercial and technical courses, and apprenticeships in factories and business houses in the United States and Mexico." Fifteen institutions of collegiate grade have signified their willingness to establish from one to four free scholarships for Mexican students. The University of Texas has done more, and on December 28 received six Mexican young men for a four years' course. The present movement arose in the American Chamber of Commerce in Mexico, at the suggestion of Mr. W. A. Peairs, of Des Moines, Ia. "What we want," says Mr. Peairs, "is to have free tuition in business colleges, smaller colleges, and universities. We want business men in each locality to assist the Mexican boys by giving them part-time employment, so that they will realize that honest toil is no disgrace, and, what is still more, impress on them the true democracy of our land and its schools." After Mr. Peairs's visit to Louisville, Ky., *The Courier-Journal* of that city thus set forth his scheme:

"Education of young Mexicans in American universities, according to a plan worked out by the American Chamber of Commerce of Mexico, not only will cement trade relations between the United States and Mexico, but also will provide a panacea for Mexican political ills and the feeling of distrust between the two countries.

"It is hoped to bring between 1500 and 2000 Mexican young men, living in every part of the country from the United States border to the Isthmus of Tehuantepec, to America in 1921 to study in the universities and work in American business houses.

"The universities are being asked to exchange scholarships with Mexican schools, according to Mr. Peairs's outline of the plan. They are not asked to furnish anything more than tuition, however. The commerce chamber requests that American business men provide part-time employment for

the young Mexicans so that they may pay for their education, in addition to obtaining a thorough knowledge of American business methods.

"Mexico City had a university when the Pilgrim Fathers landed at Plymouth Rock," Mr. Peairs says, "but wealthy Mexicans to-day send their sons to England and the countries of Europe to gain their education. It is not the sons of the rich people that we want, however. We plan to bring the sons of the peons here. They are ambitious. It is not realized generally how much they want education.

"And we don't want young men to come here with plenty of spending money. They should have to earn their own way in order to learn America. We are going to try to scatter them out as much as possible. If they flock together and live in little colonies our purpose of teaching them as much about America as possible will not be completely successful.

"I've been going to Mexico on business trips for twenty-six years, and I know from experience how much easier it is to deal with Mexicans who have been educated in America and know the country. Why, often it's just a matter of showing them where the dotted line is. You can imagine the benefit to American commerce when there will be thousands of Mexicans in the country who understand America.

"The Chamber of Commerce under this plan will be able to furnish Mexican representatives to American business firms without the least difficulty. Suppose an American asks for a Mexican representative. They will send to him an apt young Mexican who will study at an American university and work for him without any extra expense. Then the Mexican will have the double advantage of knowing his employer's business and understanding the psychology of the Mexican business men."

"The plan was proposed by Mr. Peairs at the first Mexican-American Trade Conference last February. It was greeted with favor, and a committee was appointed to take charge. The Mexicans, Mr. Peairs said, are enthusiastic. He has talked to General Obregon about the proposal and found the leader pleased with the plan."

The movement should receive help and encouragement everywhere in the country, says the *Atlanta Constitution*, "but it should appeal particularly to the South." For—

"Mexico is our next-door neighbor. The greater part, if not all, of Mexico's commerce with the United States, and much of its foreign trade, should pass through the market centers and ports of the South.

"We have much to gain by offering aid and encouragement to any movement that is aimed at Mexican welfare and the development and closer friendship between the Mexican and our own people. Aside from humanitarian motives, it means business to us.

"A thousand Mexican students studying in the universities of this country would work wonders in wiping out the animosities of the past.

"By all means let's have the Mexican students come over."

The Star, of Indianapolis, observes:

"The theory of the interchange is not new, although application of it to Mexico is an innovation. There is a great opportunity for development of the relations between this country and Mexico and the present is believed by those familiar with conditions south of the Rio Grande to be the psychological moment for launching a vigorous effort. The great difficulty in the way of trade expansion in Mexico has been a lack of understanding between us and the Mexicans that has aroused suspicion and prejudice on both sides."—*The Literary Digest*, Mar. 12, 1921.

MERCHANT MARINE

TRAINING AND MANNING OF OUR MERCHANT MARINE.—Returning to New York from a trip round the world as commander of *S. S. Westwind*, I have during my visits at different ports met with many incidents of such nature, that I feel it my duty to relay the suggestions incited by these experiences.

The suggestions I have hereunder recorded deal with the officers and crew of our merchant ships and how to man our ships in such a way, this with special reference to our fast passenger and mail service, that there will be the least inconvenience, troubles and delays as: strikes, union interference, lack of discipline and many other things too numerous to mention, but which are all objectionable to proper management of our ships, especially in our close competition with foreign nations.

First.—All American merchant ships should be manned by officers and men enlisted in the U. S. Navy.

(a) A special branch to be established in the navy called the merchant marine branch of U. S. Navy.

(b) By enlisting officers and men in the U. S. Navy, merchant marine branch, they are thereby under the Navy Rules and Regulations, which seems the only way to maintain a disciplinary standard, necessary and most suitable to our modern and growing shipping.

(c) The officers and men enlisting in the U. S. Navy, merchant marine branch, should wear the regular navy uniform. A clear distinction between Naval Reserve officers of the merchant marine branch uniform and that of the regular naval officer should be manifested, and my suggestion is: That a one-eighth ($\frac{1}{8}$ inch) inch wide light blue silk thread or cord be stitched close to the upper (upper end) gold stripe on each sleeve. This suggestion is taken from the naval reserve officers' uniform in the Royal Swedish Navy. I believe such an arrangement would also please the regular naval officer, because he would otherwise feel an infringement has been made on the uniform he is most proud of, and for which he has gone through years of special training and schooling, and it seems by right that no one but a graduate of the U. S. Naval Academy should wear the regular naval uniform.

(d) All officers and men enlisting in the U. S. Navy, merchant marine branch, will be paid standard merchant marine wages, and kept on the steamship company's payroll he is engaged by, in the same manner as at present. He will therefore not receive any pay from the navy whatsoever, except if he has retainer or confirmation pay from the Naval Reserve to which he may belong.

Conclusion.—Every merchant marine officer and sea-faring man must belong to the U. S. Navy merchant marine branch, to be able to sail in any American ship, at least in ships of and above 2500 gross tons, but he will not receive any pay from the navy, but be paid regular merchant marine wages from the company he is engaged by and for the time only that he is actually engaged on board a ship.

(e) When not actually engaged on board a ship he resumes automatically his status as an ordinary citizen.

(f) Special provision and rules to be made for officers and men engaged in the U. S. Navy merchant marine branch, in regard to wearing of uniform: (1) Uniform to be worn on board ship at all times. (2) Civilian clothing allowed to be worn when going ashore and off duty ashore. Uniform also to be allowed on shore at the option of the wearer.

(g) The letters to be used for marking the branch to which a man belongs should in this instance be f. i.: U. S. Navy (M. M.), (D.) or (E.) or (P.), each of the latter letters indicating. Deck—Engineer's Department—Pay department (including pursers, clerks, stewards, messmen.)

(h) It will be clearly seen, that if such an arrangement is made as above suggestions, it will not only mean: Better discipline, uniform regulations for all ships, uniform standard and status of all officers and men, easy means of keeping track and record every officer and man, no delays caused by strikes, union troubles, as all hands are under strict naval rules and regulations, subject to court martial. It would also mean cleaner, better ships, cleaner and better and more attractive-looking officers and men, as everybody must wear prescribed uniform on all American ships.

Officers and men enlisted in the U. S. Navy (M. M.) should be called for any other service but in merchant ships, except on his own request.

(i) All officers and men enlisted in the U. S. Navy (M. M.) should be given three months' preliminary training on board regular navy ships, before being assigned to any ships. Every officer and man should also be compelled to serve three months every fourth year on board a regular navy ship; it should, however, be preferable that six months' actual service on board a regular navy ship should be required every sixth year for two first six-year periods, and after such service has been fulfilled no other regular service on board a navy ship should be required, except in case of national emergency.

(j) If the above suggestions should become law; the navy should always have a large reserve of officers and men to draw upon and depend upon. Men that are trained and used to Navy Rules and Regulations and naval routine. Every one of such men will always be ready on a moment's notice to pack his bag and report to the ship, ready for duty. Sufficient clothing always in possession of each man.

(k) Officers and men at present enrolled in the U. S. N. R. F. and having retainer or confirmation pay, should be transferred to U. S. Navy (M. M.) and continue to draw retainer and confirmation pay as before.

(l) Navy Rules and Regulations to be changed to some extent so as to be practically applied to the running of merchant ships. Details of such changes to be worked by a board whose members have had experience both in the navy as well as merchant ships.

(m) Pension system to be adopted, similar to the system prevailing in the Swedish Navy; *f. i.*, A naval reserve officer receives 300 a year after 25 or 30 years' service, during which time he also has fulfilled all obligations and service in the regular navy and has a clear record. Amount of pension varying according to last rank held before retiring. This pension to be paid to members of U. S. Navy (M. M.) by the navy, a special appropriation to be made for that purpose. Such a pension would serve to stimulate and encourage a man's desire to join the merchant marine branch, to make him *stick* and become a valuable asset both to the navy and the merchant marine.

The above suggestions have been made, because of the experiences met with during this trip round the world, when at various ports and in American ships; the captain of one ship was compelled to pay off the whole crew, part of crews being discharged in many other instances, and troubles of all kinds existing, a situation which is alarmingly increasing, not only menacing our shipping in general, but making a bad name for us in foreign countries. Such a condition is probably due to lax shipping and marine laws, due to which the authority of a master is almost nil, when most extraordinary demands are continuously made by officers and men, in all kinds of matters, which as a whole serve as a hindrance to our growing marine.

When this ship was at Honolulu last August, several of the men in the engineering department demanded being paid off. The ship was only in for fuel oil and I had a very short time in which to get new men so as not to delay the ship. A suggestion was made to me by the U. S. Shipping Commissioner at Honolulu, that if a recruiting station and a suitable training ship be stationed at Honolulu it would be no difficulty in getting Hawaiian boys to go to sea; they are most suitable to become seamen, easily trained and very adaptable, disciplinary, clean and willing. As Honolulu is a port where many of our ships call, and where ships are many times delayed due to discharging of men, I should think the question of Honolulu as a recruiting station for U. S. S. B. as well as U. S. Navy (M. M.) should be taken up without delay. A ready supply of trained men should then be always ready at that place to replace men being discharged there for some or other reason, or to sent to some other port where needed.—By *Lieut. Commander C. H. Hermance, U. S. N. R. F.*

AMERICAN SHIPPING.—By Senator Wesley L. Jones.—Good times in this country depend largely upon our foreign trade. So long as we produce a surplus this will be so. If we must depend upon the shipping of other nations and especially of our competitors for the transportation of this surplus we are at their mercy. The success of the farmer, the manufacturer and in fact all producers rest in their hands. If we cease to produce a surplus, if we reach the time when we must bring from other countries the things required for our own wants, we are then even more at the mercy of other people if we do not have the facilities to transport these things.

Surely we have not so soon forgotten the plight we were in when the world war broke out. We were then dependent upon foreign shipping to get the things we needed from abroad and to market our surplus. We found ourselves without these facilities. Freight charges soared. Our surplus products piled up at our terminals and could not get to market, even though enormous freights are offered. Railroad facilities were choked with freight seeking ships and embargoes were placed upon them, and the sidings throughout the country were filled with loaded cars. Industry was paralyzed and thousands of our people faced ruin—all because in time of peace we had not built up our shipping but had relied upon others for our ocean carrying. In the hour of stress we were at their mercy. Boasting of our freedom, of our independence and of our power, we were wholly dependent upon and our prosperity was wholly dependent upon the nations whose ships sailed the sea. We were at peace with them. They aided us all they could because they need our products. How much more disastrous it would have been if we had been at war with them.

A nation like ours without a merchant marine is an industrial vassal in peace and a helpless combatant in war. An adequate merchant marine is more important to us than a navy, even in war. Battleships may destroy battleships. They cannot carry trade. If we have no merchant marine our enemy need only keep their battleships at home and their merchant fleet away from our ports to work upon us untold suffering and ruin, and if that enemy is a country upon whom we would ordinarily depend for much of our ocean carriage.

Surely there is no American who does not know and admit the need of an adequate merchant marine. We all want one, but are we ready to do what must be done to get it? I wish I could do something that would lead our people to a fixed determination to have a merchant marine. It is no small thing for us to do. It is the biggest thing and the hardest problem to solve that faces us now. We must get the right kind of ships. We must get our people to go to sea and must train them. We must get American agents abroad. We must establish and build up business agencies and banking facilities. American marine insurance facilities must be created. All this must be done in competition with those firmly established and well-fitted by experience in all these activities, backed by their respective governments to the limit. Can we do it? We can, and we must. There is no human thing we cannot do if we will. We have the ability, the capacity, the energy, the initiative, the wealth and the power to do whatever human effort can do, if we will. What we need is the will to do. While recognizing the difficulties, we must counsel with our courage and not with our fears. If our people will determine to do this great thing regardless of cost or opposition we will succeed. It will cost money and take effort. We will suffer losses. We will meet with setbacks. We must endure discouragements. Our competitors will do all they can to keep us off the sea. They will scare us if they can. They will bluff us if they can. They will seek to discourage us. They will beat us if they can. I find no fault with them. I do not criticise them for this. Rather I honor them for it. They are looking after their own interests. I want to take a leaf from their book. I want our people and our government to look after

our interests as Britain and other countries and their peoples look after their interests.

We are not doing this now. There are many people and agencies in this country who are now doing more to prevent an American merchant marine than all direct foreign agencies. Some are acting unwittingly. Others I fear are acting purposely. Some are honest in their fears. Others are doing the will of alien agencies under the cloak of Americanism. The results of one are just as deadly as the other.

On the Pacific and in the Far East is a fertile field for the development of our commerce and our shipping. A short time ago several of our army officers were going across the Pacific to their various stations. They discussed shipping. Every one took the position that we could not establish a merchant marine. All agreed that the British had the experience, the training and the facilities and that they could do the ocean carrying cheaper than we can and therefore we should not contest with them to do it. On inquiry it is learned that before they started a United States army officer had given a lecture to their class in our War College and had taken this position. These men are probably at their various stations innocently but none the less effectively aiding the British marine. Just think of a United States army officer taking such a position in the face of the strong desire of this people to build up a merchant marine and of the experience we had only six years ago when any saving of the years by reason of cheap foreign carriage was wiped out in a few months and civilization hung in the balance while we built up in feverish haste and with prodigal wastefulness what we should have developed and maintained through the years. Our papers almost daily ran great headlines charging wastefulness, inefficiency and graft in the operation of the Shipping Board. The laying up of ships is made a feature and the loss in the operation of our shipping is pointed to as an evidence of our inefficiency. This tends only to discourage and dishearten our people. These things were inevitable with the conditions under which our ships were built and are more of a reflection upon our people and their patriotism than on the efficiency of the Shipping Board. The government is laying up ships, but why are we not told that private owners and operators are laying up ships, too. Nor are we the only people whose ships are being laid up. Besides our wooden ships we have laid up three or four hundred steel ships, but I am reliably informed that twelve or fifteen hundred British ships are also laid up. Shipping is not the only industry that is in a bad way. All of our industries will recover if we will just look to their future, bear with fortitude the ills of the present and determine to succeed. We must not let our indignation at what we think is the incompetency and graft of our public officials blind us to the need of the future.

A great legislator, moved with indignation at the apparent incompetency of the men of the Shipping Board, declared a short time ago, in substance, that not another dollar would be taken out of the treasury with his consent to run our fleet and that the board must depend on receipts from operations and sales of ships. That will be cheering news to our competitors. No more deadly blow could be struck at our merchant marine than to follow such a course. If that is to be our policy all that alien shipping interests need do is to sit tight and wait for the inevitable. We should get rid of inefficient, incompetent or dishonest agents if there are any, but we must keep our shipping going until world conditions improve, as they will. We must carry on this great enterprise just as private parties carry on their enterprises through bad times as well as good. If we are not ready and willing to do this we might as well quit right now trying to build up a merchant marine. No halting, hesitating, halfway policy will succeed.

Let me call to your attention one cheering fact. Before the war only eight or nine per cent of our foreign commerce was carried in American

ships. To-day we are carrying about forty per cent, or nearly half in American ships.

Alien shipping interests have close connections with our great business enterprises. This was one thing that grew up of the fact that we were depending for so many years upon them for our shipping. Through these relationships they seek to mold public opinion and direct the action of our leaders of thought and enterprise. It is a tremendous, insidious and far-reaching influence, and I have about reached the point that if I find any man or agency opposing our laws or belittling our efforts and magnifying our difficulties in building up a merchant marine I look for some of these influences. I do not urge you to do this, but I think just now it is a pretty safe guide for those to follow who earnestly want an American merchant marine. I proceed on the assumption which I think is a safe one) that foreign interests, private or governmental, will do all they can to keep up off the sea.

The people of this country are proud of the great city of New York and of the commanding position it holds in world affairs. No one desires to do anything to retard its growth or lessen its influence so long as that influence is directed toward promoting American interests. Above state interests, should be the interests of the nation. These should be made supreme in the heart, desire and effort of every American and of every American community. A feeling is taking root throughout the country that alien interests are seeking through New York to control the enterprises of this nation. They know that foreign shipping interests center here and that much of whatever adds to the foreign business of New York benefits alien shipping. They are beginning to feel that certain influences are directing the action of certain governmental agencies in such a way as to concentrate here the export and import trade of the country to the detriment of other ports as well as to the injury of the producers. They are beginning to suspect that foreign shipping concerns, acting through interlocking directorates, etc., are very largely responsible for such a state of affairs. They are beginning to wonder if they could not afford to pay a considerable sum for an American merchant marine that will sail from different ports to carry to foreign markets the products for export that are naturally tributary to such ports. The people cannot understand why it would not be better and cheaper to export or import from other ports where car and ship meet than to send cargo from ship to the car or from the car to the ship as it does from New York to interior points hundreds of miles away. I was told in Newark the other night that it costs \$50, a car freight from Pittsburgh to Newark and \$50 from there to the ship in New York harbor. That is a burden on commerce that ought to be removed. The people of Newark urge the improvement of their part of New York harbor to save that expense. They urge it as a national benefit. It will be a national benefit, but it will be a greater national benefit if our export trade can be relieved of that burden and at the same time be largely carried in American ships, and if, to do that, much of our commerce must be sent to other ports, this should be done and American ships made available there to carry it. The American people would like to see in New York that intense American spirit that we must have to build up an American marine. We want to see the great papers of New York urging unity among our people. We want to see them urging their support and the enforcement of law, whether relating to shipping or otherwise. We want to see them urging us to stand by our rights and the using of the measures that are necessary to prevent discriminations against us. We want to see them urging the people to be willing to sacrifice and not be discouraged at losses until our merchant marine is established. We want to see them urging the people to look to the future and not fill their columns with mistakes of the past with relations to our ships. In a word, we would like to see all the great papers of New York and the heads and leaders of great enterprises in New York express their faith in the ability

of our people to build up a merchant marine and to urge their support of every measure that may be deemed necessary to secure it. Let every American do his duty and insure for our flag a merchant marine commensurate with power, wealth and needs of this great nation.—*The National Marine*, February, 1921.

CONDITIONS OF SUCCESS IN THE MERCHANT MARINE.—Since the Spanish War, that is to say, for nearly a quarter of a century, there has been a more or less persistent effort to awaken the United States to the need for a merchant marine. The steady, and in late years phenomenal, growth of our foreign trade necessarily gave increasing emphasis to this movement. Before the war, it was estimated that we paid out about 300 million dollars per year in freight charges to foreign-owned shipping companies, and it was urged that if we had our own ships, this large sum of money would be diverted to the United States.

To-day we own such a fleet, but, unfortunately, its profitable operation is handicapped by shipping laws which impose such a heavy handicap upon American ships that they cannot possibly compete with those which fly a foreign flag. This is true, in spite of the fact that the general increase in wages throughout the world has brought this element in the cost of ship operations well up to the American level. Thus, thanks to the laws governing the operation of American ships, our splendid new merchant marine finds itself handicapped by having to carry much larger crews than its competitors. The accommodations for our seamen are more spacious and comfortable, and as to the way they are fed, the menu in the fo'castle of some of our ships would make many a city clerk or mechanic green with envy. This generous provision for the American seaman, so far as health and bodily comfort are concerned, is all to the good and will meet with approval; but anyone who is familiar with the problems of shipping operations will realize that this advancement of the conditions of housing, food and work imposes such a handicap upon our ships that, if we are to compete successfully with foreign-owned ships and to carry all of our own trade and a reasonable share of the trade of the world, it will be absolutely necessary for Congress to make good the difference in the shape of a very substantial annual subsidy from the national treasury.

Either that, or our shipping laws must undergo a drastic revision.

Hitherto, those of us who have striven to awaken the United States to the commercial and naval advantages that would follow from its possession of a powerful merchant marine have found that the mere mention of the word "subsidy" has acted like a spark in a powder magazine, except among the peoples who live along the seaboard and have an intelligent and sympathetic understanding of the shipping question. There is this difference, however, between the situation to-day and then. Formerly, we possessed no merchant marine. To-day we possess a great fleet composed largely of recently-built and thoroughly up-to-date freighters representing, so far as the one-half of it owned by the Shipping Board is concerned, an outlay of about four billion dollars of Uncle Sam's money.

It is certain that matters cannot go on as they are. To-day the operation of these ships is a losing proposition. We cannot go out of business, for one reason because nobody in these times of terrific depression and abnormally low freights would care to buy our ships at any reasonable figure. That being the case, what does the nation wish to do with this splendid property? Are we willing to sell the ships for a mere fraction of their cost? Shall we let them rest at moorings? Or shall we bring a little national pride into the matter and send these vessels, well equipped and manned by American crews, to display the American flag on all the seven seas, with the assurance that the taxpayers of the country are, to a man, behind the great venture and will cheerfully make good a deficit which is largely due to world conditions over which we have no control.—*The Scientific American*, Feb. 19, 1921.

AERONAUTICS

AERONAUTICS IN 1920 IN GREAT BRITAIN.—A general review of events of the past year, of which the part referring to commercial aeronautics is of particular interest.

From an examination of results obtained on the mail service from London to Paris, it would appear that out of 391 flights 298 (76 per cent) were completed without a delay of more than three hours. In 16 cases the flights were completed during the day on which they were started, but without a delay of more than three hours. In 77 cases the flights were either completed on the following day, not completed at all, or not started.

Railway passengers would probably have just cause to complain if one train in every four on a certain line between two cities failed to make the trip with a delay less than three hours.

It has also been found that aerial transportation both of passengers and freight is still very costly as compared with other methods. The main reason, however, why the public distrusts aerial transportation is on account of the impression of danger.

Turning to the records of the past year in England it is found that during the 17 months from May, 1919, to September, 1920, according to Air Ministry statistics, 100,285 passengers were carried in England in machines licensed for civilian flying. In this period seven pilots and eight passengers were killed in air accidents, and 13 pilots and 15 passengers were injured. The casualty rates per thousand passengers carried were thus 0.07 pilot and 0.08 passenger killed, and 0.13 pilot and 0.15 passenger injured. If the same rate of accidents prevailed on British railroads 140,000 passengers would be killed each year and over 260,00 injured, while in something like three months all the engine drivers in England would have lost their lives. Admitting that such a comparison may involve gross errors, the margin against the safety of flying is still quite great.

As regards the status of production, the Sopwith Company went into liquidation, the Aircraft Manufacturing Company was absorbed by another concern, while the British Nieuport, the General Aircraft Company, the Grahame-White and the British Aerial Transport Company have practically closed the doors. The Vickers, Ltd., has been doing some work on training machines and on an order from the Chinese Government. Several companies, however, are fairly active in developing new types.—*Mechanical Engineering*, March, 1921.

NEW 1000 HORSEPOWER AERO ENGINE.—*London.*—According to *The Evening News*, a powerful new Napier aero engine, called "The Cub," which, it is claimed, will revolutionize air travel, has undergone successful tests. It is an 18-cylinder engine of 1000 horsepower, and is intended for use by the Royal Air Force.

On its test the engine gave 1057 horsepower and was run for 20 hours. It weighs just under a ton and cost about £5000. It is understood that two "Cubs" are to be fitted to the *Titania*, a large flying boat which is being built by the Fairey Aviation Company. The *Titania*, says *The Evening News*, will have a range of about 1500 miles, and in wartime would carry crews of about ten. If adopted to civil use it probably could accommodate 50 people.

The paper declares that the advent of "The Cub" engine opens up possibilities of regular daily transatlantic service with giant flying boats of 5000 horsepower, carrying 250 passengers.—*The Aerial Age Weekly*, Feb. 14, 1921.

PREPAREDNESS IN THE AIR.—A business man who has insured his factory for many years does not complain that he has paid premiums for nothing because there has been no destructive fire in his building; nor, if he is a practical man, does he consider insuring his property for \$10,000 when it is worth ten times as much. Congress does not look at insurance of the

country against the waste of war as sensibly. Constantly are heard complaints that too much money has been spent upon the army and navy for national defense, and when appropriations are wanted to equip a branch of the military service adequately a half or a third is allowed, no matter how good a case is made out for more. Thus the country carries less insurance than it should have, which is bad business.

The House Committee on Appropriations has recommended that \$19,200,000 be allowed by army aviation, although Brig. General William Mitchell, Assistant Chief of the Army Air Service, had asked for \$60,000,000, of which \$17,000,000 was to be spent to equip units with modern aeroplanes. "Those we have now," he told the House Military Affairs Committee on January 4th, "are obsolete, old and becoming unsafe." There was such wastage during the war in building American aeroplanes on a colossal plan which proved to be a shocking failure that Congress is suspicious when the development of the air service of the army or navy on a modest scale is urged now. And members of Congress, of whom drastic economy in most things is expected, are prone to cut down every estimate asked for with small regard for the need of the appropriation. Even when there is crying need for money for the upkeep of an established and meritorious institution the knife goes through the estimate just the same, often leaving it a remnant. If the appropriation wanted is for national defense, the danger of another war is declared to be remote. Little attention is given to the wisdom of full insurance.

House committees may not accept General Mitchell as the most eminent authority on military aviation, and they may be disposed to turn to others for information about naval aeronautics, but in his appearances before the Military Affairs Committee early in January and the Appropriations Committee last week he surely qualified as an expert both at the front in France and since the war as Assistant Chief of the Army Air Service. What General Mitchell told the committees about the offensive and defensive power of the aeroplane on sea or land was not new, although more than one Representative seemed to hear it for the first time. Unfortunately there are few members of Congress who make a study of war inventions and preparedness. At the hearing early in January General Mitchell stated that the French were maintaining a force of 3000 land planes, and that the British, besides keeping up a formidable army flying corps, were acquiring ocean aircraft carriers and developing machines to fight above the water, while the United States lagged behind in aviation. The committees he addressed listened to illustrations of war in the air with wonder or incredulity. How great cities might be gassed from the sky by planes brought to the coast on aircraft carriers, unless there should be a defensive force to drive the enemy off, should have made a profound impression in the telling.

All the horrors described by General Mitchell, America may experience if other wars are to be waged and preparedness has been neglected. He pleaded with his hearers for a demonstration of what bombing planes could accomplish in attack upon an obsolete war vessel selected for experiment. That may be the business of the navy, but certainly one of the old battleships of the Spanish War could be spared for a thorough test. And other demonstrations of the destructiveness of bombs dropped from the air would be educational. If Congress can be made to understand the offensive power of aircraft on land and sea, adequate appropriations may not come so hard.—(Editorial in *N. Y. Times*).—*Aerial Age Weekly*, Feb. 14, 1921.

GENERAL MITCHELL ON THE AIR SERVICE APPROPRIATIONS.—Brig. General William A. Mitchell, Assistant Chief of the Army Air Service, made a plea before the House Committee on Appropriations January 28 for adequate funds to develop aviation as a means of military defense, especially of

the coast cities. The committee in the Army Bill which was reported recently, however, recommends the appropriation of only \$19,200,000 instead of the \$60,000,000 which had been asked.

General Mitchell insisted that the aeroplane had become so much superior to the battleship that a well-balanced military program must include a large aerial force to be effective in the next war. He said that a sufficiently large force could be formed and equipped in three years at a cost of \$45,000,000, which represented no more than the cost of a battle-cruiser.

General Mitchell wanted the committee to recommend the use of the former German liners *Leviathan*, *Von Steuben* and *Agamemnon* as aeroplane carriers. With these fast ships carrying an air force, he said, they could be quickly carried to any zone of operations. With these ships equipped the entire Atlantic Coast could be well protected, he said.

"The vulnerable part of our country is from the Chesapeake Bay up to Boston, and from New York to Chicago," said the general. "By having an air force ready for action somewhere in New Jersey you can reach any part of that area within two or three hours, whereas you could not do it in less than a day or two with railway guns, and then they could have little effect. You must remember that it takes an hour at least to put railway guns into firing position and we can go 110 miles an hour with our bombardment aeroplanes, much more with our pursuit. We can shift our air forces within 25 to 30 flying hours from the east to the west coast, and from the North to the South in the same proportion of time.

"You must remember, also, that battleships cost \$45,000,000 each, and we can build a thousand aeroplanes for the cost of each battleship.

"The whole training of the navy is that the armored ship is mistress of the sea, whereas actually it is just as helpless as the armored knight was when firearms were brought against him."

General Mitchell said that 600 aeroplanes—60 per cent pursuit, 20 per cent attack, and 20 per cent bombing—would be sufficient to protect the Atlantic Coast, while the Pacific should have the same number. As a protection for the land, 1200 other planes were needed, he said.

The officer asserted that, with the improvements in aviation and bombing, "any ship in existence can be destroyed to-day." He told how in a test attack with bombs on the old battleship *Indiana* aircraft 5000 feet up made 11 per cent of hits.

Explaining the use of gas against cities, General Mitchell said:

"We believe that in the next war gas might be used by a barbarous foe on the centers of communication. We know just how much gas has to be put down on these centers to interrupt communication. Take New York and an area in the vicinity ten miles by ten miles. If two tons of crying gas are dropped by aeroplanes or airships there once in eight days, it will make everybody wear gas masks and goggles.

"If we want to keep that place covered with mustard gas, we can put down 70 tons once in eight days and everybody will have to protect themselves against mustard gas in that area. If we want to kill everybody in that area and use phosgene, we have to put down 200 tons of phosgene once in eight days and it will keep that area covered. All you have to do is to go over that area once every eight days and keep it inundated with gas. The only protection against such a procedure is protection in the air."—*Aerial Age Weekly*, Feb. 7, 1921.

APPROPRIATIONS FOR NAVAL AVIATION.—Following is a statement made by Capt. T. T. Craven, Director of Naval Aviation, before the Naval Affairs Committee of the House of Representatives:

The committee has before it an analysis of the estimates for naval aviation for the fiscal year 1922.

The estimates are divided up and analyzed as has been the case for the past two years and under the same subheads as before.

The Department submits a request for a total of \$35,000,000. Considerable progress in fleet aviation has been made during the past year despite

the difficulties connected with all naval operations due to shortage and changing of personnel which have interfered with training everywhere. In the Pacific the aviation activities have been based largely in the San Diego region, where a fine climate and a shore base near to the drill ground for ships has materially assisted operations. The Atlantic Fleet has operated in the West Indies and also on our own coast, and has had conditions not as favorable as those experienced by the Pacific division of the fleet. There has been constant effort to make aviation a fleet activity. Difficulty has been experienced because of the absence of vessels capable of adequately caring for aviation interests. The *Shawmut* and the *Aroostook*, two mine layers, have been continued as aviation tenders and have given excellent service in that capacity, despite the fact that they are not fitted for this work and have simply been loaned by the mine force to aviation. If these two crat had not been with the Atlantic and Pacific fleets, naval aviation would have had to continue to base its efforts entirely upon the shore. In addition to the *Shawmut* and *Aroostook* acting as mother ships for the large aeroplanes which now accompany the fleets, the destroyers *Harding* and *Mugford* have been loaned to the two fleets as tenders for groups of large flying boats of the NC type. In the Atlantic fleet a mine sweeper, the *Sandpiper*, has also assisted as a tender for the purpose of aviation.

Four battleships in each fleet have been fitted to convey planes and each of these ships has been equipped with two heavier-than-air machines, which they have flown from the turrets. A number of vessels of various classes are equipped with kite balloon winches and are prepared to operate knife balloons. A kite balloon division has been organized in the Atlantic and in the Pacific to continue development to the kite balloon operations.

While material progress has been made with fleet aviation, it must be clearly understood that without the conveniences and the machines permitting the development of aviation afloat with a minimum of effort and inconvenience to ships, the progress of molding aviation into the naval establishment afloat necessarily will be slow.

I believe I am correct in stating that the difficulties for the sailor who flies are as much greater than those of the flyer over land as is the case with all of the other highly technical operations which a seaman undertakes by comparison with the work of the soldier. The development of military and naval aviation came about during the World's War and during that struggle the land operations of aviation were carried on intensely and constantly. The major effort of naval aviation was the suppression of the submarine and only towards the close of the struggle did it find a place in the fleet. The supremacy of land aviation put its stamp upon naval thought and until now the effort has been to improvise for naval purposes machines and tactics developed primarily for use over the land. Even the type of machine to be employed from ships cannot be the same as that best employed from shore. Those who are unfamiliar with naval subjects and the naval problem cannot understand this idea, which is in direct opposition to the view that a united Air Service is either practicable or desirable.

The aviation service which the navy desires to-day, and which it must have, is an arm which will assist it to defeat the enemy at sea. This is its paramount present-day essential. In so far as this detail is concerned, and regardless of future developments, the matter now is purely a naval one which the navy alone is competent to handle.

Because of the stress given to land aviation, the development of the land plane and of aviation tactics over the land in conjunction with troops has progressed far beyond the uncertain stage of experimentation. In the combined service which has been developed in England, the preponderance of experience and of skill and technical talent rests with the branch, by far most numerous, composed of flyers who have wone their laurels over the land. Consequently, the attempt has been to compromise and to adapt the land type of machine to naval purposes. Development has been slow

for two reasons: first, because Great Britain has two services in the same ship occupied with a common problem. It is not difficult to understand why progress has been impeded as a result of this arrangement. A second obstacle has been that incidental to the attempt to compromise the land type and to improvise the machines for ships' use rather than to attack the problem of the design of a machine for overseas work directly, which is distinct and separate from that involved in the design of land machines. There are certain principles which must be embodied in machines to be used from ships. The first is (a) flotation, which provides reasonable safety for the pilot and for the machine. Unless flotation is supplied which insures reasonable safety, the development of the tactics of aviation for naval purposes will not proceed, as the commander-in-chief and the commanding officers of vessels employing aircraft will not wish to hazard the aviation personnel in developing the tactical usefulness of aviation in time of peace and in studying the tactical employment of this arm. Consequently, interest in aviation and the application of aviation, in so far as the navy is concerned, cannot be obtained unless this characteristic is given to naval planes. An effort to compromise the land type of plane by fitting it with air bags for work over water has not been satisfactory as a means for fulfilling naval requirements.

A second quality essential for naval planes is (b) ruggedness and dependability, capable of being easily and quickly taken down and assembled, and when taken down, capable of compact stowage.

The conveyance of planes on the decks or turrets of ships adds one more mental burden to the great load carried by the captain of a naval unit. Planes carried on decks or turrets are very much in the way and one cannot expect to find planes in general use from various types of ships until machines have appeared which can be taken down easily and stowed in-board out of the weather and in a way in which they do not interfere with ship activities. It would seem that we must look to metal as material for assisting us to obtain this characteristic. Features which permit the quick taking down and assembly of planes are of far greater importance to the navy than to the army.

The third attribute to be incorporated in a naval plane is (c) ability to fly from a vessel, either directly or assisted, and to land on the deck of a vessel or in the water. The necessity for this characteristic is self-evident and in order that planes may be carried in different types of vessels it is essential that they may get away from the ship with a very short run or that a machine such as a catapult be supplied by which they may be projected into the air. A plane must be fitted to land on a deck or on the water. The land flyer is not concerned with these details.

A fourth attribute is (d) low landing speed. It can be readily seen that the closer the speed of a plane approaches the speed of a plane carrier—the ship upon which she desires to land—the easier a landing becomes upon the deck of such a vessel. A plane with an excessively high landing speed cannot land upon the deck of a carrier. The importance of low landing speed is supreme for planes to be conveyed in ships of the carrier type.

Having accepted the four above-mentioned characteristics as essentials, we then have a fifth which must be included in order that a machine carried by ships may serve a useful end. Such a plane must be (e) capable of conveying and of usefully applying military power. This involves performance, ability to communicate, and the employment of weapons.

It is evident that these characteristics cannot be secured without sacrifice to some degree of the high performances now given to the plane of purely a land type, but the navy must accept this penalty in the aviation arm as it does in all the arms conveyed in surface and subsurface vessels.

If one considers the five characteristics enumerated above and has knowledge of the conditions of the art as it exists to-day, it becomes evident that the naval problem is far from solution and it is seen that the time for standardization in so far as naval types are concerned is far in the future.

In other words, development of naval planes can only be carried on experimentally and it is of vital importance that the operator and the designer work closely hand in hand. Standardization is as yet impossible. The proposition to combine the production of machines for the army and navy therefore is illogical and can only result in delaying the naval branch in its effort to acquire the apparatus which will permit it to definitely give to aviation the place belonging to it in naval affairs.

Steps to Be Taken for the Procurement of New Types of Machines.—The following steps must be taken in order to attack directly the problem in hand by the navy for the procurement of machines adapted to its use:

(1) Encourage designers to develop planes suitable for naval purposes, through competition or otherwise.

(2) Encourage manufacturers to produce planes of different sizes incorporating the above requirements, through contracts.

(3) Improve and augment the experimental facilities of the aircraft factory and enlarge the technical designing force.

(4) Investigate and purchase abroad any types of aircraft which seemingly are well adapted for our purposes.

The development has proceeded along the lines indicated above. The lack of technical designers is felt keenly, particularly as many reserve officers who were employed in work of this nature have left the service, and with the departure of each one an unfilled vacancy in an important field remains. It is earnestly hoped that the limitations in regard to the amount which may be spent for classified and technical employees may be increased in order to permit the navy to proceed with the important work in hand. The solution of our problem has been retarded for lack of a carrier with which to carry on our experimental work. The conversion of the *Langley* (*ex Jupiter*) will be completed during the coming spring and when that vessel become available we will be able to make a start toward the solution we desire. A bigger and a faster ship than the *Jupiter* must be provided, however, before we can hope to attain final results.

The conversion of the *Wright* has been delayed and that vessel will not be ready for many months. When commissioned the ship will serve a most useful purpose as a base or tender for large seaplanes and for a kite balloon unit.

Funds for experimental work should not be curtailed, and pending the development of machines best adapted for use from shipboard planes not so excellent for naval purposes must be supplied in sufficient numbers to permit the development of organization and skill of personnel.

The personnel of aviation during the fiscal year 1922 is expected to be about 800 officers and 7000 men in the navy and 124 officers and 1100 men in the Marine Corps. At present a total of 631 officers are employed on aviation duty, of whom 362 are aviators and 53 student aviators. We have a total of 60 heavier-than-air and lighter-than-air enlisted pilots and a total of about 7200 enlisted men employed in aviation duty, of whom 3000 are at the Training School at Great Lakes.

A detachment of 15 officers and 45 enlisted men is on duty in England in connection with the construction of the rigid being manufactured for our naval service. This contingent is being instructed in the operation of rigid by the British. The completion of the ship has been retarded somewhat, as has also been the hangar intended for her reception in this country. It now looks as though the vessel would be completed in March and the hangar at Lakehurst would be ready for occupancy on July 1. It is probable that the ship will make the passage across the Atlantic early in July.

During the year shortage of personnel made it necessary to place the air stations at Chatham and at Cape May on an inoperative basis. These stations have been closed and placed under caretakers.

The station at Rockaway has operated throughout the year. The amount of money spent at this place has been kept low and nothing has been spent

on public works beyond what was absolutely necessary for upkeep. The matter of the acquirement by the government of the land on which the station stands has been taken up with the authorities in New York, but no arrangements have been consummated to this end.

It is evident that it is of great importance to the government to preserve aviation facilities in the neighborhood of large centers of population. Only through the maintenance of such establishments interest in flying on the part of many individuals who would be immediately useful as flyers in the event of war can be sustained and a reserve of aviators perpetuated.

There has been considerable progress in the completion of the station at Hampton Roads, which during the next year will become our important aviation operating base on the Atlantic Coast.

There is no aviation station south of Hampton Roads within the continental limits of the United States, with the exception of the school at Pensacola. The activities at this place have been augmented considerably during the past few months because of the larger classes which are now being sent there made up of officers of the regular navy. This is probably one of the most active flying schools in the world.

A small station at Coco Solo in the Canal Zone, established during the war, has continued to struggle on with the limited conveniences supplied during hostilities. The importance of supplying adequate facilities insuring the protection of the Panama Canal would make it evident that a considerable sum should be devoted to the improvement of the aviation facilities in the Canal Zone in the near future. Better provision should be made for the housing of personnel station at this post.

On the west coast, San Diego has been a very active center during the past 12 months, and the importance of this point will increase during the coming year. Up to the present no decision has been reached in regard to the site for the rigid hangar for the construction of which money was appropriated by Congress last year.

It is expected that contracts for the establishment of the station at Pearl Harbor, authorized by the last Congress, will be let in the near future.

The Great Lakes mechanics' school has continued to fill a most useful rôle and is engaged in the training of aviation mechanics. Every one who has visited this institution has been impressed with the excellence of the course given to young men sent to this station. I believe it to be one of the leading, if not the leading, manual training school in the world. The only flying facilities at Great Lakes are those supplied during the war by private contribution, and it would seem most desirable that a hangar should be erected at this place which will permit flying in this locality. The Department has been seriously embarrassed during the past year because of the lack of facilities in this neighborhood where there is little that can be supplied reserve officers for the purpose of continuing their flight exercises and flight training.

The development of the torpedoplane is being undertaken seriously by the Navy Department. In order to carry on this work it is necessary to have flying facilities at places where it is convenient to run torpedoes. During the past year we have endeavored to carry on torpedo work at Yorktown, but in order to insure the progress which we desire, the Bureau of Ordnance is very anxious that facilities permitting the use of aviation should be created near the torpedo station at Newport.

It will be noted that no money has been requested for seaplanes, as it has been assumed that the planes left over from the stock accumulated during the war will be available for another 18 months. It costs a considerable amount to recondition these machines, but the large boats on hand are well worth this expenditure.

In the estimates presented to the committee, it will be noted that a total of 67 heavier-than-air planes are requested for the navy and 61 planes for the marines. This is a very conservative number; certainly it would seem impossible for us to do with less, and were it not for the large number of

seaplanes on hand which will also be utilized, a far greater number of heavier-than-air craft than the 128 requested should be authorized.

Lighter-than-air activities everywhere have been very much curtailed. With the commissioning of a tender which will permit the better employment of the kite balloon, greater interest in the use of these units is to be expected. At the present time operations with kite balloons in the fleet are attended with serious difficulties.

The war definitely determined the airship to be primarily a naval unit. The Allied navies found the non-rigid airship to be of value in the anti-submarine campaign in convoy and patrol operations. The Germans demonstrated the usefulness of the rigid as a naval scout, after abandoning this type for offensive overland operations.

The rigid airship in its present state of development has a wide cruising radius and an ability to stay in the air for long periods of time. Owing to the excellent visibility and weather conditions prevailing in the Pacific and West Indian areas rigidships would be of tremendous value in event of war to a fleet operating in these theatres.

The small non-rigidships requested will always be useful for coastal work in time of war and are valuable as training units for lighter-than-air personnel. After his course in non-rigidships, the pilot should then be competent to begin his instruction in rigid airships. During the coming year we will have one rigid in operation and one under erection in this country. We cannot be expected exhaustively to study the usefulness of rigidships for naval work with but two ships of this character, and it is to be hoped that the Congress will see fit to continue our development in this line.

The Department has a giant seaplane under construction. A small amount of money has already been expended on this project from that appropriated for experimental work. The construction of a great ship along the line proposed by the Department is directly in the road of progress and should be continued. A considerable sum is requested for construction of stations, and a considerable part of this sum is to be devoted to construction in the Philippines, at Dutch Flats, and on the Pacific Coast rigid station.

The disinclination to appropriate unduly for naval shore activities is thoroughly appreciated and unquestionably ideas on this line are entirely correct, but it is submitted in passing that aviation is a new branch which does not fit itself readily into any of the naval shore establishments and bases already in existence, and facilities permitting flying must be created before flying can be conducted. All naval operations of every kind must always be based upon the land. This is true for work with ships as well as aircraft, and consequently any money wisely spent in shore development is a permanent asset and cannot be wasted in so far as aviation is concerned.

In the estimates for maintenance of stations, effort has been made to cut, and figures have been based upon actual performances during the past year. The fund for experimental work is believed to be the minimum that should be supplied. The matter of anti-aircraft research and methods for withstanding aircraft attack has recently been investigated by a board in the Navy Department, and it is evident that a considerable sum must be devoted to this important work. The recommendations of this board were not received until after the estimates herein contained had been submitted, but it is believed that the amount requested by the board (\$1,000,000) can be covered in the total of \$35,000,000 recommended for aviation purposes during this year.

It will be noted that an increase of \$125,000 is proposed for drafting, clerical, and technical service. All progressive experimental and design work in aviation has been very much retarded through the lack of trained and skilled technicians. This is particularly the case now that many of the reserve officers, formerly employed in technical capacities, have left

the service. Something must be done to enable the navy to retain adequate technical assistance in order to insure the development of aviation.—*Aerial Age Weekly*, Feb. 7, 1921.

ENGINEERING

ELECTRIC SHIP PROPULSION DISCUSSED.—The question of whether reduction gearing or electricity is better for ship propulsion was the principal subject of discussion at a joint meeting of the New York sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, held on January 28. The chief features of interest in a lengthy program were an address by Admiral Benson, chairman of the United States Shipping Board, and two papers on ship propulsion by Eskil Berg, of the General Electric Co., and W. E. Thau, of the Westinghouse Electric & Manufacturing Co.

Admiral Benson pointed out the need of perfecting every possible device for making our merchant ships more efficient, in order that we may hold our present position in world trade and eventually make it stronger. He gave it as his opinion that the system of ship propulsion that will ultimately prove superior to all others for mercantile vessels as well as warships is the "Diesel-electric" type. He said he had the utmost confidence in the new merchant ship *Eclipse*, the electric propulsion machinery of which was described in *Power* for Nov. 2, 1920; that he had, in spite of criticism, sent this vessel on its first voyage all the way to the East Indies; and that the latest report, from Singapore, stated there had not been a bit of trouble since leaving port.

Mr. Berg, in his paper, "Turbine Reduction Gears *vs.* Electric Propulsion for Ships," said that the question depends entirely upon the type and operating conditions of the vessel concerned. He pointed out that the Navy Department has decided upon electric drive for all the larger vessels, but he described the geared turbine as being more advantageous in fast destroyers and light cruisers where the propeller speed is always high. In the case of mercantile ships he felt that each individual installation deserves study and that no general rule can be drawn except, possibly, that electricity is better for fast passenger liners.

In summing up, the speaker gave the following points in favor of electric drive.

It affords easy reversal at full power by electrical connections without reversing the turbine.

It makes it possible quickly to detect trouble and to check up on fuel consumption, by means of voltmeters, ammeters, and other accurate electrical instruments.

It is practically noiseless.

Electrification of mills and factories has greatly reduced maintenance cost and is expected to have the same result on ships.

It makes possible economical cruising at reduced speeds.

In case several generating units are used, one may be shut down without impairing the efficiency of the complete installation.

As the turbine is never reversed and there are no reverse blades dragging, a higher degree of superheat and higher steam pressure may safely be used.

The omission of reversing blades shortens and lightens the turbine shaft and thus permits higher speeds and longer bearing life.

The generating units may be put in any convenient place, near the boilers, for instance, and the motor at the extreme stern if desired, thus eliminating the space requirements and bearing troubles of a long propeller shaft.

Arrangements may be made to drive the main auxiliaries by electricity, so that if the main generating unit breaks down, steerageway may be maintained by the auxiliary unit.

Comparing the efficiency of electric drive with that of gear drive, Mr. Berg declared that there is little difference in fairly large installations, such as 3000 horsepower and over. He gave about 92 to 94 per cent as representative efficiencies of the transmission apparatus, consisting of gear in one case and a generator and motor in the other. He put the cost of electric drive slightly higher than for gear drive.

W. E. Thau, in his paper, "Electric Propulsion of Ships," agreed with Mr. Berg that the type of drive depends upon a number of different factors, so that no system of propulsion can well be recommended for general use. He regarded electric drive as a logical and successful development, but declared that the geared turbine drive has come to stay and has a legitimate field. He described the internal-combustion or Diesel drive as offering possibilities superior to those of any other type. Mr. Thau said, however, that the development of high-speed Diesel units for electric drive has not been perfected in sizes that will permit a drive in excess of approximately 6000 horsepower. He advocated the use of a number of small, high-speed Diesel engines so as to obtain greater flexibility and reserve power.

In the discussion that followed the papers, G. A. Pierce, of the William Cramp & Sons Ship & Engine Building Co., defended strongly the use of turbine reduction gears and criticized electric drive, particularly for its complexity and the difficulty of training men to handle it at sea. He even questioned the superiority of electric drive at cruising speeds over a well-designed turbine installation containing geared cruising turbines. He asserted that the full-power reversing made possible by electric drive is unimportant, because no more than about one-third of full power can properly be utilized in stopping a ship and no more than that is needed in backing. He then read a statement from J. F. Metten, chief engineer of the Cramp Company, which said that proponents of electric drive generally compare the newest and best examples of that system with selected failures of gear drives, and that in his opinion the latter type will eventually prove its superiority.

Commander C. A. Jones, of the U. S. Navy, on the other hand, said that as far as capital ships in the navy are concerned, electric drive has come to stay, and also that no great difficulty has been encountered in training the engineer force to handle the electrical machinery involved.—*Power*, Feb. 8, 1921.

PROBLEMS AWAITING SOLUTION IN DIESEL-ENGINE DESIGN.—Problems and Probable Field of the Oil Engine, Paul Rieppel. The author starts with the discussion of the economical and political problems connected with the control of the world's supplies of oil and of the application of the oil engine—by which he means the various types of internal-combustion engines, the Diesel and its modifications being first considered. In the course of the article the author makes many interesting observations and raises several questions well worth attention.

Combustion Processes.—As regards the nature of combustion processes in the Diesel engine, our knowledge has reached the point where we can clearly distinguish the processes of injection, vaporization, gas formation and combustion. The author believes, however, that a very wide field in this domain remains as yet unexplored and that more work should be done in the laboratory by the physicist, such work being preferable in many cases to extensive experimentation on actual engines.

The most rapid and complete combustion is a function of the fineness of atomization, intermixture with air, and, to an extent which has not yet been fully appreciated, of turbulence. No thorough tests have been made to determine what is the best method to obtain the most complete atomization and what fineness of atomization is needed under each set of conditions.

As to the influence of catalysis in the cylinder, whether that due to presence of water or of some other catalytically acting material, the tests

of Stein contain valuable material, but the influence of very small, in fact extremely small, amounts of water on fuel combustion remains as yet to be investigated. As a matter of fact we know that under certain conditions very poor oils burn better in the presence of water, and the use of other catalytic agents, such as silicon and various metals, may bring startling developments in engine design and offer a means of increasing our ability to control combustion.

How to obtain the best possible conditions of turbulence and how to evaluate the influence of turbulence are questions which may be answered by tests on self-ignition of oils and the velocity of flame propagation therein. In a bomb, oil vapor at rest does not ignite at all at temperatures corresponding to the temperature of compression in a Diesel engine, but when a slight turbulence is produced, as for example, by injecting a small amount of air, self-ignition takes place. This and other questions must be considered by everyone interested in the subject of combustion processes, and they are not mere academic problems but important stones in the foundation upon which the structure of economic design of an engine has to be raised. Had we had this information a highly economic Diesel engine could have been designed long ago and have done away with the compressor. From this the author proceeds to the discussion of various attempts to build a Diesel engine without a compressor, such as have been proposed by Vickers, Price and Steinbecker.

Economy of Operation.—In the determination of the economy of operation, questions as to the use of a 4-stroke or 2-stroke cycle, high or medium pressures, are ones which lie at the foundation of the problem. After discussing briefly the relative position of the 4- and 2-stroke cycles and the question of scavenging, the author proceeds to the question of compression and asks whether we shall continue to operate Diesel engines with a combustion of 35 atoms, and the heavy weight of the engine and mechanical difficulties which it involves.

The higher thermal efficiency secured with this compression does not have decisive value in the author's eyes, as motors employing lower compression pressures would have a lower first cost, be more reliable and show a better mechanical efficiency. As regards the advantage secured through self-ignition of the mixture, it is pointed out that the point of self-ignition is lowered very materially when the cooling produced by the expanding stream of the injection air is eliminated. With solid injection every condition of engine operation can be met without external means of ignition at a pressure of 25 atoms. But even assuming that self-ignition would have to be dispensed with, why not? The high value placed on the ability of the engine to operate on a basis of self-ignition is a survival of a time when electrical ignition was still complicated and unreliable. To-day it is quite easy to provide reliable means of producing a good electric spark having a good control of timing, or, where necessary, to produce a wire spirally wound and maintained constantly at a glowing heat by a flow of electric current. There is no reason why one should not employ outside methods of ignition in engines in which the most economical operation may be secured at compressions at which self-ignition can no longer be relied upon.

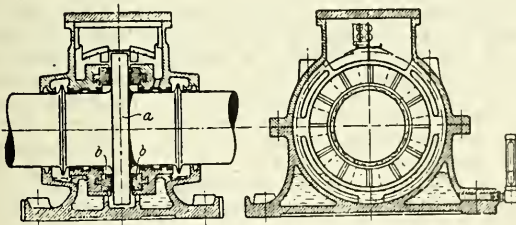
In connection with the problem of securing the most economical operation of oil engines, the author takes up the question of utilization of waste heat. It is true that as high as 40 per cent of the heat in the fuel may be usefully employed in the oil engine, but this is no reason why one should waste the other 60 per cent without any effort at recovery. The comparison with the 12 per cent heat efficiency of the steam engine is often misleading because in a steam engine a good deal of the heat in the exhaust steam may be still utilized for purposes of heating and drying. In properly conducted factory processes employing steam, the power generated by the steam engine should be considered as a mere by-product, while in the case of oil-engine drive it is the main if not the only product of fuel combustion.

The problem of utilizing the waste heat of oil engines is one of the most important from an economical point of view. The usual way is to pass the exhaust gases on to steam boilers, a method well known in large gas-engine operation. This cannot be done as conveniently with oil engines, because the temperature of the exhaust gases is considerably lower. Furthermore, any attempt at a thorough utilization of exhaust heat from oil engines would involve a considerable increase in the first cost of the installation and also possibly corrosion troubles due to the presence of sulphurous acid in the exhaust gases. In particular, in the case of auxiliary boilers on shipboard, it has been found advisable to equip them with direct oil heating in addition to heating by exhaust gases. An important physical problem is the determination of the coefficient of heat transfer from exhaust gases to the boiler wall. This is a question proposed by Nusselt, but, in general, the coefficients now employed are more or less of a rough nature and do not take into consideration many important factors.

In this connection may be mentioned attempts to mix the exhaust gases with steam and to add to them compressed air and utilize the mixture either in turbines or in reciprocating engines. It does not appear that any such efforts may lead to useful conclusions.—*Mechanical Engineering*, March, 1921.

KRUPP'S SINGLE COLLAR THRUST BEARINGS.—This new type of bearing is a modification of the well-known Michell thrust block. It is made in two types: oil bath and pressure feed.

In the case of the oil bath type the single thrust collar dips into the sump and, rotating, carries the oil along its circumference. This oil is



collected by a scraper at the top end of the bearing, and flows along troughs in this scraper to the ducts feeding the journal bearings of the thrust shaft. The troughs in the scraper are so arranged as to work for both directions of rotation. The oil level in the bath is kept below the bottom part of the shaft, an oil indicator being provided for the purpose. At the outer ends of the two journal bearings oil thrower rings are provided on the shaft, which throw the oil creeping past the bearing back into the sump. To prevent any oil leakage past the bearing cover, ordinary ring glands are provided. The oil caught by the sides of the thrust collar lubricates the thrust blocks or pads, which in the main follow the Michell design, i. e., provide a wedge clearance, allowing a much higher initial pressure to be maintained without breaking the oil film. These blocks are white-metal lined, and their entering edge is rounded off to allow a better access of oil. In the Krupp design of these pads the special cage to hold them, as in the Michell type, is done away with, the blocks being kept in position in a ring groove of the bearing body by means of hook-shaped lugs. The length of these lugs is about two-thirds of the length of the pad; this allows a certain amount of rolling of the latter to give the necessary wedge-shaped clearance. The propeller thrust is transferred through those pads to the bearing body and to the ship's hull. A number of these thrust

bearings were supplied to the German submarines. The pressure type consists of one journal bearing and two thrust collars, the oil being fed to the center groove in the bearing and then leaks past it to the thrust collars, which carry it away to lubricate the pads contained at both ends of the journal bearing. In this case only one side of the thrust collar rests against pads, and one collar working at a time.—*The Technical Review*, Feb. 15, 1921.

ORDNANCE

MILITARY INITIANTS AND THE INDUSTRIES OF PEACE.—The conclusion of an article on the utilisation of military initiants for peaceful purposes. The disposal of certain surplus detonators, caps, and safety fuze is dealt with, and conclusions drawn as to the developments necessary in the industry as a result of war experience.

It is emphasized that every endeavor should be made to restrict the varieties of detonators and caps manufactured, such varieties as are kept being made useful for as many purposes as possible, both for industrial and military use. Production should in all cases be possible with existing machinery, and the design should be as simple as possible, thus facilitating increase of production when necessary. Detonator shells should never require more than five pressings, and all with threads, flanges, etc., should be eliminated. Aluminum should be universally adopted for their manufacture. This is undoubtedly the future material for the purpose, and Germany's war experience in its use should enable her to get in front of foreign competitors and re-establish her overseas trade in the commodity. Fulminate of mercury in detonators must be replaced as rapidly as possible, tetryl and trinitrotoluene with a small quantity of lead azide being introduced for all varieties. The latter must be further investigated. As a covering, silk must be replaced by home-produced material. For safety fuze coverings it is also essential that foreign materials such as guttapercha be eliminated, and acetyl-cellulose is suggested as an alternative. The practice of regarding discoveries as the trade secret of a small group of manufacturers must also be replaced by the exchange of ideas, in order to insure the best practice throughout the industry, and the elimination of unsatisfactory or unnecessary varieties. The synthetic manufacture of alcohol is also a matter urgently requiring investigation, so that in any future emergency it would be unnecessary to utilize such an important food as potatoes in its production. (Paul Galewsky, *Zeitschrift für das gesamte Schiess- und Sprengstoffwesen*. Nov. 1, 1920.)—*The Technical Review*, Feb. 15, 1921.

MERCURIC AZIDE.—An account of the preparation and some of the properties of a fulminating agent of great violence, and, under certain conditions, extreme sensitivity. The preparation was undertaken as part of a research to discover a highly sensitive initiant, but this feature is so highly developed in mercuric azide that the substance is incapable of being put to practical use. Its preparation is described as one of the most dangerous and treacherous operations known to chemistry.

The mercuric azide was prepared by placing 6.5 gm. of sodium azide in a small flask and adding concentrated sulphuric acid drop by drop, the evolved hydrazoic acid being led to the bottom of a container in which had previously been placed 10 gm. of mercuric oxide and 200 gm. of boiling water. The oxide quickly disappears, and a nearly concentrated solution of mercuric azide is formed. The excess mercuric oxide is quickly separated by filtering through a hot water jacketed funnel, the solution being caught in a number of beakers and stirred continuously with a wooden rod to prevent the formation of large crystals. Rapid radiation from the beaker walls must be prevented, as otherwise clots of crystals form thereon, when an explosion is certain. If the solution is not agitated, long acicular crystals form, and these explode as soon as movement

occurs, the whole mass detonating even when under water. The crystals are white and transparent at first, but turn bright yellow on exposure to light. If crystallized under agitation, the product is a crystalline powder, and has a similar sensitivity to impact to fulminate of mercury. Crystals over 1 mm. in size are, however, extremely dangerous. It is recorded that a small clot of crystals which formed in the funnel stem and were removed by washing with water, sank through a considerable depth of water in the beaker, and on touching the bottom detonated violently, completely destroying the apparatus, making a hole of about 2 cm. diameter through the wooden bench, and projecting glass particles no larger than dust clean through thick-walled glass apparatus in the vicinity. An alternative method of preparation is to mix cold concentrated solutions of sodium azide and mercuric nitrate, when the mercuric azide is formed as a cheese-like precipitate. In this extremely fine state of division the substance appears to be somewhat less sensitive than lead azide. Mercuric azide is of the same molecular weight, and on explosion releases the same amount of gas as fulminate of mercury, but the former is more brisant than any other of the known azides, and is capable of causing the complete detonation of high explosives when quantities are used of only one-twentieth to one-thirtieth of the weight of the fulminate of mercury which is necessary. While the detonation of the fulminate is accompanied by a dull, reddish, indefinite flame, that of the azide is a remarkable bright blue flash of almost magical tint. (Alfred Stettbacher, *Zeitschrift für das gesamte Schiess- und Sprengstoffwesen.*)—*The Technical Review*, Feb. 15, 1921.

SHORE BATTERIES ATTACK U. S. S. "MASSACHUSETTS."—Highly successful firing tests were made in January by our Coast Artillery against the old battleship *Massachusetts* off Pensacola Harbor, Florida. They proved that more destructive results can be obtained by firing projectiles from guns, mortars and howitzers at high angles than by horizontal attack against the belt armor. Twenty-five hits were obtained out of 85 rounds, the high angle firing being at distances of from 5000 to 6000 yards, carried out by 12-inch mortars. The results showed that railway artillery is as accurate as the fixed gun, and this in spite of the greater length of range. A number of hits were obtained by 12-inch railway guns at the great range of 20,000 yards.—*The Scientific American*, Feb. 26, 1921.

MISCELLANEOUS

REASONS FOR AMERICAN UNPOPULARITY ABROAD.—Men who go abroad in the interests of foreign trade are oftentimes surprised to find that this country is unpopular among foreigners to whom we desire to sell our goods. On their return these travelers are occasionally interviewed by reporters, whose stories appear in the newspapers under such headings as "Says Argentinos Dislike Us," "Brazilians Offended, Threaten Reprisals," or "Europeans Affronted by Treatment Here." If we endeavor to trace the cause of this ill-will we usually find that it has its origin in the actions of our lawmakers and officials. While, in fact, our commercial representatives are striving to extend our foreign trade our legislators and department heads are doing everything possible to destroy their work. Good will is the essence of successful trading, a fact that is apparently forgotten by those who seek to abrogate our commercial treaties with foreign countries, to establish discriminatory duties against foreign shipping and raise a tariff wall that would shut out numerous imports from nations with which we expect to trade. In addition to all this, foreigners are constantly irritated by the enforcement of annoying and frequently unnecessary rules and regulations which, in some cases are likely to provoke retaliation.

A good example of this sort of officialism is the recently announced ruling that foreign ships are not to be allowed to enter United States ports with alcoholic liquor on board, regardless of whether it is sealed or in transit from one country to another. This attempt to force our dry laws on foreigners, even if the ruling remains a dead letter, is none the less intolerable. It has already been severely condemned in all parts of the world. Quite apart from any moral factor entering into the drink question, this interference with the liberties of other people is bad business, and it is not likely to increase our popularity abroad. In any event there can be no doubt that any effort to enforce the ruling would precipitate strong opposition in which the principal maritime nations overseas would be firmly united.—*The Nautical Gazette*, Feb. 2, 1921.

WORLD'S TRADE REVIVAL HINGES ON REVISION OF PEACE TREATIES.—Shipping men are realizing more and more that no permanent improvement in ocean transportation rates can take place until the countries of the world begin to interchange goods on something like the pre-war scale. Experts are agreed that the principal cause of the present widespread economic crisis is the inability of the nations of Central and Eastern Europe, which formerly absorbed one-third of the world's output of raw materials, to purchase their usual quota of products. For this state of affairs the unwise economic clauses inserted in the Paris peace treaties are largely responsible. These treaties have been drawn on the theory that the way for the victors in the war to obtain economic supremacy was by putting fetters on the trade and diminishing the resources of the enemy states. The fact was overlooked that no nation can be plunged into adversity without its neighbors being similarly affected.

How true this assertion concerning the commercial interdependency of nations is appears from the figures of Hamburg's ocean traffic during recent years appearing on another page. One reason for the existing depression in British shipping is that British vessels of only 952,000 net tons had occasion to call at Hamburg last year, while the British merchant fleet putting in at the same port in 1913 aggregated 4,096,000 tons. The two-thirds shrinkage recorded in Hamburg's overseas trade between 1913 and 1920 has therefore diminished considerably the opportunities for the profitable employment of British shipping, which could not fail to gain were Germany's trade to revive. Instead of recognizing this truth, however, the Allies insisted upon the surrender of all of Germany's ocean-going fleet, thereby correspondingly retarding the ex-enemy country's economic rehabilitation. The tonnage thus parted with the Germans could have used to good advantage, while the Allies are experiencing difficulty in keeping it employed. Of the 301 German vessels allocated to Great Britain, only about half had been sold according to last accounts. Many of those undisposed of are tied up in British harbors doing no good to anybody, while those recently marketed have been sold at such low prices that the British exchequer has been but slightly benefited.

If the Allied statesmen could only be made to realize that in helping Central Europe to its feet they would be removing one cause of unemployment in their own countries, the return of normal trade conditions could be greatly hastened by undoing the mistakes of the peace treaties. But unless they are willing to pursue such an enlightened policy it is certain that the economic restoration of Europe will be long delayed to the detriment and mutual loss of all the great trading nations and with the resultant continued prostration of the world's shipping.—*The Nautical Gazette*, Feb. 26, 1921.

CONCRETE SHIPBUILDING IS STILL IN EARLY EXPERIMENTAL STAGES.—In a communication to the *Nautical Magazine*, attention is called to the fact that, whereas shipbuilding in wood and steel has practically reached its

finality, the use of concrete for this purpose is still in its infancy. Improvements are constantly being made in the direction of lighter and stronger mixtures together with the more effective disposal of the steel reinforcement and concrete.

By using a coke aggregate for instance, where the material is mixed with Portland cement to form concrete, the weight per cubic foot has been reduced from 160 to 110 pounds and even further improvements in this direction may be expected. Already ships can be built of concrete which weigh less than wooden vessels of equal cargo-carrying capacity, and in time the weight of concrete hulls may even approach that of those built of steel.

In addition to being lighter, concrete has other advantages over wood for shipbuilding, being cheaper and more durable, while costing much less for repairs and upkeep. The position is fully appreciated in Norway where a very successful concrete shipyard has been in operation for several years in spite of the plentiful supplies of timber procurable in that country at comparatively low prices. At this establishment a concrete motor ship of 1000 tons was lately completed. In Denmark also concrete shipbuilding is being carried on, two vessels of 1300 tons having been recently built there.

In England one of the most enterprising of British concrete shipbuilding concerns is Concrete Seacraft, Ltd., on the Mersey, which employs the Ritchie unit system of construction. According to this method 75 per cent of the hull is made up from small units which are cast separately, to be assembled and set up at the building berth. Each unit consists of a section of the shell between the frames, in fact, flanges at the ends form the latter.

With transverse frames joints are arranged at the bilges and keelson, so that such frame is in four parts. Longitudinal members are continuous, holes or notches being provided for them in the transverse units. Naturally they are cast after the latter have been placed in position. Cross diagonal bracing bars which pass through notches in the frames are arranged over the entire hull. Finally the spaces between the frame flanges are grouted with cement.

Either the transverse or longitudinal method of building may be employed with the Ritchie system. It has the further advantage of facilitating the inspection of every part. Owing to this feature, Lloyd's and other classification societies are willing to allow a great reduction of thickness as against the casting of the complete ship on the building site. By the Ritchie method a thickness between frames of $1\frac{3}{4}$ inches is considered enough for vessels of 250 tons, while only $2\frac{1}{2}$ inches are demanded for those with deadweight capacities of 1000 tons. In the former case a thickness of $3\frac{1}{2}$ inches is insisted upon with the older form of construction.

One notable benefit accruing to the use of concrete for shipbuilding is its anti-fouling properties. It is not suggested that no fouling takes place, but the growths are very much lower and more easily removed than is the case with steel and wooden hulls. It is also quite possible that by rendering the underwater bodies with neat cement to a smooth surface even better results may be achieved.

The outstanding advantages of concrete, however, is the low cost of upkeep. So far as is known at present ships built of concrete are almost everlasting. Naturally, rails, bulwarks, and other exposed parts will be occasionally chipped and damaged, but these can be made good as when new by a builder at an almost trifling cost. Not long since the 5000-ton American concrete steamer *Faith* had a hole knocked in her side owing to a collision with another vessel, but the damage is said to have been made good by a bricklayer and his mate for £5.

Officers and engineers who have sailed the seas in concrete ships state that the behavior of these crafts is excellent when seas are running. All

agree that there is a notable absence of vibration, while it is generally admitted that concrete ships are more easily driven than those of wood and steel having a like displacement. In other words, the speed is higher for a given horsepower and tonnage.—*The Nautical Gazette*, March 5, 1921.

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NOTES ON INTERNATIONAL AFFAIRS

FROM FEBRUARY 10 TO MARCH 10

PREPARED BY

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LONDON CONFERENCE ENDS IN FAILURE

In accordance with previous plans, Allied representatives met those of Germany in London during the first week of March for the purpose of presenting to Germany the reparation terms as finally decided upon by the Allies. The Allied representatives, as it developed later, were ready to consider changes in the method of payment, and in details, but were in no mood to accept such radical reductions as Germany submitted by way of counter-proposals.

The Allied terms called for payment of about 226 billion gold marks, spread over a period of 42 years, and a 12% tax on German exports. In his initial reply on March 1, the German Foreign Minister, Dr. Simons, proposed that the total sum be reduced at once to 50 billion marks, that about 20 million be subtracted from this for reparations already made, and that on the remaining 30 million marks (about 7½ billion dollars) Germany pay 1 billion marks a year until 1926, when the whole question would come up for readjustment. In immediate reply Premier Lloyd George declared: "The German Government appears to have a complete misunderstanding of the realities of the situation, and the Allies have already agreed that the German proposal is one they cannot examine or discuss." On the following day he insisted that Germany must continue to accept responsibility for the war, that she had already been guilty of violations of the treaty, and that her people were not as heavily taxed as those of Allied nations. The Germans were given four days in which to accept the Allied terms or present an offer worthy of consideration.

FINAL REJECTION OF GERMAN COUNTER PROPOSALS.—On Monday, March 7, Minister Simons presented a modified proposal, which was indeed more nearly that which he had been authorized to make by his government. In brief, he agreed to pay the annuities demanded by the Allies (two billion marks) for a period of five years. Even this, however, was contingent upon Germany's retention of Upper Silesia in the approaching plebiscite, so that, as the British Premier said, it was an offer for five weeks and not for five years. As to what would be done at the end of the five years no assurance was given. The offer was therefore rejected as wholly unsatisfactory.

ENFORCEMENT OF PENALTIES.—Immediately upon the conclusion of the London Conference the Allied powers proceeded to execute the penalties which had been agreed upon in the event of German refusal. These consisted of occupation of Duisburg, Ruhrort, and Duesseldorf, ports for the Ruhr region on the east bank of the Rhine; a tax not to exceed 50% on the sale price of German goods in Allied countries; and establishment of a customs line along the Rhine. It was explained that, in the application of the 50% tax, a purchaser of German goods in Allied countries would pay half the purchase price to his own government, which would give him a certificate to be turned over by him to the German merchant, who would get the certificate redeemed by the German Government in German money. On March 7 the Allied forces, consisting chiefly of about 10,000 French and 5000 Belgians, were in movement and had completed the occupation of the Rhine ports on the following day.

The Germans offered no resistance, but declared they would protest to the League of Nations on the ground that no penalties should have been inflicted until May 1, the date set by the Versailles Treaty as the limit for agreement on reparations. The Treaty read, however, that the terms must be presented *on or before* that date. Furthermore, the Allies based their action on violations by Germany of other treaty terms. Upon the execution of the penalties, Germany as a protest recalled her envoys from London, Paris, and Rome.

READJUSTMENT IN NEAR EAST

REVISION OF TURKISH TREATY.—Prior to the Reparations Conference, delegates from Turkey and Greece were requested to meet in London to consider a revision of the Treaty of Sevres. In preparation for the conference, former Premier Venizelos of Greece worked in cooperation with the representative of King Constantine's government, Premier Kalogeropoulos, aiming to retain the acquisitions granted to Greece by the treaty. Both the Constantinople government of Turkey and the Turkish Nationalists sent delegates, the two factions working with perhaps more coordination than appeared on the surface.

The meetings, which began on February 21, were devoted chiefly to hearing the Greek and Turkish claims. No general action was taken aside from a decision that an investigation be made of conditions in Smyrna and Thrace prior to alteration of the treaty.

The French Government, which was favorable to the Turkish Nationalists and responsible for their inclusion at the conference, reached terms for a treaty of peace with that faction. The treaty provides for French evacuation of Cilicia in eastern Asia Minor, on condition of Turkish acceptance of the proposals made in London for protection of minorities in regions under Nationalist control.

PERSIAN CABINET UPSET.—A force of 2500 Persian Nationalist Cossacks on February 22 entered the Persian capital, Teheran, and compelled the resignation of Premier Sephandar Pasha. It is not known whether British

influence was in any way connected with the coup, both the Premier and the Nationalists being supposedly opposed to British domination of Persian politics.

BRITISH RAIL ROUTE TO INDIA.—Washington, Feb. 20 (*Associated Press*).—The complete text of the Franco-British convention of December 23, 1920, by which the Syrian Desert is transferred from a French to a British mandate was received here to-day, and is expected to engage the close attention of officials of the State Department.

The two phases of the treaty which have engaged particular attention are the establishment of the precedent of a transfer of mandate territory from one power to another without reference to the League of Nations, and the acquisition by Great Britain of her dream of an all-rail route from the Mediterranean to India.

The southern portion of Syria, bordering upon Palestine, previously allotted to France by the League of Nations, is transferred to Great Britain, and specific provision is made for the construction of a British railway line linking Palestine with the Mesopotamian railway systems through the Syrian Desert.

Part of the British all-rail route from India to the Mediterranean, according to advices received in official circles recently, was begun secretly during the war and has been completed from Quetta, in Northern India, to a point in Central Persia, skirting the Afghanistan border. The rail route from Palestine would cross the Syrian Desert and, passing through Basra, in Southern Mesopotamia, would effect a junction with the line already completed from India at a point in Southern Persia. With the transfer of Southern Syria from France to Great Britain, according to officials, only the Southern Persian link would be left outside the political control of Great Britain, and even this link is now partly under her political and wholly under her military control.—*N. Y. Times*, Feb. 21, 1920.

LEAGUE OF NATIONS AND MANDATES

LEAGUE COUNCIL MEETING IN PARIS.—The League Council meeting in Paris on February 21 was devoted largely to routine matters. After lengthy discussion with representatives of Poland and Lithuania, it was decided that the plebiscite for the Vilna district and the sending of an international force thither should be abandoned, owing to failure of both nations to refrain from military activities in the disputed area. The territorial dispute will again be taken up in direct negotiations at Brussels, presided over by M. Paul Huymans as representative of the League.

A committee was appointed to consider amendments to the League Covenant and report at the Assembly meeting in September. Proposed changes include the Canadian amendment eliminating Article X and the Argentine proposal for immediate admission of all nations.

AMERICAN PROTEST OVER MANDATES.—At the Council session on February 22, the U. S. Ambassador to France presented a note from Secretary Colby insisting upon the right of the United States to a voice in all discussions and decisions as to the terms on which mandates should be granted. The note reaffirmed the principles set forth in the note to the British Foreign Office last November. It insisted on equality of economic opportunity and the "open door" in mandate territories for all nations whether or not members of the League of Nations. It called attention to

apparent violations of this principle in the British mandate over Mesopotamia, and cited the reservations made by President Wilson regarding the Japanese mandate over the island of Yap.

COUNCIL REPLY CONCILIATORY.—In reply to the American note, the Council stated that the allocation of Yap to Japan was made not by the League Council but by the Supreme Council of the Allied Powers in May, 1919, and the misunderstanding should therefore be taken up with the nations represented in that body. The Council, however, had in its session of December 17, 1920, approved the form of Class C mandates covering former German possessions in the Pacific.

Regarding Class A mandates, including Mesopotamia and other former possessions of Turkey, action on the part of the Council was postponed until May or June. The Council invited the United States to send a representative to take part in its discussions at that time.

BRITISH POSITION UNYIELDING.—Washington, March 5.—The British Foreign Office's reply to the Colby note on mandates, in which the American demand for equal opportunity for United States nationals in the economic employment of Mesopotamia was advanced, is conciliatory in tone, but rejects the American contentions in respect of Mesopotamia.

The British Government, while in the main agreeing with the Colby definition of the principles controlling mandates, subscribes reservations, but in the instance of Mesopotamia flatly declares that it will not "discriminate" against its own nationals, maintaining that Britishers obtained monopolistic rights in Mesopotamia before mandates were conceived, and even before the outbreak of the war.

As the question of mandates is one of the keystones to the entire American position regarding the rights of this country flowing out of the victory over the Central Empires, it is understood that Secretary of State Hughes, before beginning the draft of a reply to the British note, will review the whole subject, from the inception of mandates at Paris to the acts of the American plenipotentiaries and government both during and after the Peace Conference.

It is felt here the Mesopotamia issue is not in precisely the same category as the Island of Yap, as the British Government now maintains that the exclusive rights it asserts in Mesopotamia were not acquired as a result of the war, but antedated the war and bear no proper relation to the mandate. The determination of the Yap issue, it is said, depends upon Mr. Hughes's findings, after examination, in respect of the reservations filed by President Wilson at Paris.

The Senate Foreign Relations Committee is known to have accepted the validity of the reservations, and it is said to insist upon their effectiveness, and there appears to be little doubt that the new Administration tends to maintain the same position as that defined by the Wilson Administration on the subject of Yap. The continuance of Under Secretary of State Davis, although only temporarily, as a delegate to the Communications Conference, is accepted generally not only as a compliment to Mr. Davis, in appreciation of his work on that body, but as an indication of the likely attitude of Mr. Hughes toward the Yap and cables problems.—*N. Y. Times*, March 6, 1920.

JAPAN WILL INSIST ON RETENTION OF YAP.—Regarding the attitude of Japan on control of the island of Yap, Count Ishii, Japanese Ambassador to France, expressed the opinion that his government would be willing to "compromise" on some such basis as a guarantee of free use of the island for cable purposes without surrender of Japanese control,

Foreign Minister Uchida, speaking in the Japanese Diet on March 7, pointed out that notes on the subject had been exchanged last year between the United States and Japan. When the mandates were considered, he continued, President Wilson protested, but when the final decision was reached America made no reservations. He added that he considered the question of the Yap mandate definitely decided. As for the question of the concession of Pacific cables to the United States, he said he was unable to speak on it.

MANDATES AND OPEN DOOR.—Mandates have been divided into three groups, Class A including former Turkish possessions, Class B former German possessions in Central Africa, and Class C German possessions in Southwest Africa and the Pacific. A statement issued by the News Bureau of the League of Nations Association points out that the Class B mandates guarantee economic equality only to league members.

The open door restrictions are considered by the News Bureau as having a direct bearing upon the United States as a non-member of the League. The article regarding the open door says:

"The mandatory will insure to all nationals of states, members of the League of Nations, on the same footing as his own nationals, freedom of transit and navigation, and complete economic commercial and industrial equality; provided that the mandatory shall be free to organize essential public works and services on such terms and conditions as he thinks just.

"Concessions for the development of the natural resources of the territory shall be granted by the mandatory without distinction on grounds of nationality between the nationals of all states members of the League of Nations, but on such conditions as will maintain intact the authority of the local government."

However, the British mandate over Palestine, the full text of which appeared in the *N. Y. Times* of February 28, made no such distinction between nations within and outside the league.

ARGENTINA REFUSES TO BAR GERMAN MUNITIONS.—According to news despatches of February 18, the Argentine Government had refused the request of the Allied Powers that it bar German exportation of war materials to Argentina in contravention of the Treaty of Versailles. Argentina took the ground that German violations were not the concern of a nation not a party to the treaty. The Allied Powers can, however, check German exports by means of their control commissions in Germany.

GREAT BRITAIN

MILNER REPORT URGES FREE EGYPT.—The report of Lord Milner, former British Colonial Secretary, on the Egyptian question was presented to Parliament on February 18. It urged that negotiations should be started as soon as possible for the conclusion of a treaty according self-government to Egypt, with her own foreign representatives, but without complete withdrawal of British supervision. The document, which is dated December 29, 1920, includes a memorandum agreed upon in negotiations with Egyptian representatives as a basis for the proposed treaty.

THE IRISH PROBLEM.—During the month ending March 10 there was little apparent change in the Irish situation. Premier Lloyd George on February 15 declared that conditions were "definitely and decidedly improving," that boycotting was at an end, that Irish recruits were again joining the constabulary, and that the Crown police and courts were recovering authority. He stated that one company of the constabulary, according to the unpublished Strickland report, were involved in the Cork burnings and would be punished.

On February 16 President Eammon de Valera of the Sinn Feiners sent a protest to members of the British Parliament against seizure of fire-arms, use of hostages, torture of prisoners, and other methods employed by British forces "contrary to all rules of civilized warfare." The Irish Republic on March 7 issued a manifesto to foreign nations reciting the grievances of Ireland and claiming their desire for "peace on a just basis."

The Mayor of Limerick, George Clancy, the ex-mayor, and another citizen were murdered in their homes on the evening of March 6. It was claimed that the murders were in reprisal for the assassination of the British Brigadier General Cumming on March 4.

SPAIN

PREMIER ASSASSINATED.—Premier Eduardo Dato of Spain was assassinated on the evening of March 8 in Madrid while returning from the Chamber in a motor car. He was attacked by several persons, who fired a number of shots.

Dato was leader of a group of the Conservative party and has headed the government for a large part of the time during and since the war. Last October he announced a program of sweeping industrial reforms, combined with strong measures for suppressing internal disorders. Dato resigned in January, but was persuaded to remain in office.

RUSSIA

POLES SECURE AID AGAINST SOVIET.—The Franco-Polish Agreement recently negotiated by Marshal Pilsudski is said to assure French expert military advice, munitions, and supplies, but no French troops, in the event of an attack on Poland by Russia. It is also reported that a defensive alliance against the Soviets has been entered into by Poland, Bulgaria, and Hungary.

PETROGRAD IN REVOLT.—Anti-Red uprisings in Russia and especially in the Petrograd district, beginning in the latter part of February, increased in scope until on March 9 it was reported that the revolutionary forces, controlling eight ships of the Baltic fleet and the Kronstadt fortress, had silenced the minor forts of Petrograd and were preparing to enter the city. Later despatches indicated that the revolt had been checked.

UNITED STATES

INAUGURAL STATEMENT ON FOREIGN POLICY.—The following passages of President Harding's inaugural address were studied with interest as clues to the new administration's foreign policy:

"The recorded progress of our Republic, materially and spiritually, in itself proves the wisdom of the inherited policy of non-involvement in Old World affairs. Confident of our ability to work out our own destiny and jealously guarding our right to do so, we seek no part in directing the destinies of the Old World. *We do not mean to be entangled. We will accept no responsibility except as our own conscience and judgment in each instance may determine.*

"Our eyes never will be blind to a developing menace, our ears never deaf to the call of civilization. We recognize the new order in the world with the closer contacts which progress has wrought. We sense the call of the human heart for fellowship, fraternity and co-operation. We crave friendship and harbor no hate. But America, our America, the America builded on the foundation laid by the inspired fathers, *can be a party to no permanent military alliance. It can enter into no political commitments, nor assume any economic obligations or subject our decisions to any other than our own authority.*

"I am sure our own people will not misunderstand nor will the world misconstrue. We have no thought to impede the paths to closer friendship. We wish to promote understanding. We want to do our part in making offensive warfare so hateful that governments and peoples who resort to it must prove the righteousness of their cause or stand as outlaws before the bar of civilization.

"We are ready to associate ourselves with the nations of the world, great and small, for conference, for counsel, to seek the expressed views of world opinion, to recommend a way to approximate disarmament and relieve the crushing burdens of military and naval establishments. We elect to participate in suggesting plans for mediation, conciliation and arbitration, and would gladly join in that expressed conscience of progress which seeks to clarify and write the laws of international relationship, and establish a world court for the disposition of such justiciable questions as nations are agreed to submit thereto.

"In expressing aspirations, in seeking practical plans, in translating humanity's new concept of righteousness, justice and its hatred of war into recommended action we are ready most heartily to unite, *but every commitment must be made in the exercise of our national sovereignty.*

"Since freedom impelled and independence inspired and nationality exalted, a world super-government is contrary to everything we cherish and can have no sanction by our Republic. This is not selfishness, it is sanctity. It is not aloofness, it is security. It is not suspicion of others, it is patriotic adherence to the things which made us what we are."

SENATE VOTES FOR ARMS CONFERENCE.—By a unanimous vote the Senate on March 1 attached to the Naval Appropriations Bill the Borah resolution calling upon the President to invite a conference of the United States, Great Britain, and Japan to consider naval reductions. This action followed a lively seven-hour debate on the navy and foreign problems. Action on the bill itself was postponed until the next session of Congress through the opposition of a minority led by Senator Borah.

VIVIANI TO COME AS FRENCH ENVOY.—In March the French Government is to send René Viviani to the United States for about two weeks to present the views of France to the new administration and present argu-

ments in support of the Versailles Treaty and against a separate peace with Berlin.

NOT PLEDGED AS TO ALLIED DEBTS.—In a conference with Mr. Harding on February 15, Mr. Thomas W. Lamont, one of Mr. Wilson's financial advisers at the Peace Conference, gave assurance that the United States had made absolutely no secret or public agreement "that the Allied indebtedness should in whole or in part be cancelled."

COLUMBIAN TREATY REPORTED.—Washington, March 7.—The Senate Committee on Foreign Relations reported out favorably to-day various treaties, some of which have been pending for years, including the Colombia Treaty.

The Colombian Treaty as reported to the Senate is with a few exceptions the same treaty as was sent to the Senate by President Wilson on June 16, 1914. Article I of the original treaty, which expressed to Colombia "in the name of the people of the United States, sincere regret that anything should have occurred to interrupt or mar the relations of cordial friendship that had so long subsisted between the two nations" is eliminated. This was the section that was so bitterly opposed by friends of Colonel Roosevelt, the reference in the section being to the Panama insurrection of November, 1903.

In the original treaty the United States was obligated to pay Colombia \$25,000,000 in gold within six months after the exchange of ratifications. In the amended treaty the money will be paid in five instalments of \$5,000,000 each, the first in six months after ratifications and the other four in annual payments.—*N. Y. Times*, March 8, 1920.

PANAMA-COSTA RICA DISPUTE

BORDER CONFLICTS.—On February 20 Costa Rican forces invaded and took possession of the town of Coto on the Pacific side of the Panama-Costa Rica frontier. A week later they were driven out by a cavalry troop of Panamans with the loss of two men and 35 prisoners. It was reported on March 6 that Costa Rican forces had advanced into Panama territory on the Atlantic side of the isthmus and occupied Bocas del Toro and Almirante.

CAUSE OF DISPUTE.—Until the recent disturbance, the two countries had observed a "status quo" frontier agreed upon in the early eighties of the last century. A commission headed by President Loubet of France in 1900 awarded the Coto district to Costa Rica and a region north and west of the River Sixaola on the Atlantic side to Panama. This was confirmed by an arbitration decision of Chief Justice White in 1914. Panama, however, has refused to evacuate the Coto territory until Costa Rica gave up the territory on the Atlantic side.

AMERICAN INTERVENTION.—Following the seizure of Coto by Costa Rica the United States Government sent notes to each country insisting that peaceable means be adopted to settle their conflicting claims. The reply of Panama is stated to have expressed willingness to accept the good offices of the United States, while that of Costa Rica was less favorable.

Second identic notes were despatched by Secretary Hughes on March 5 insisting that the troops of each nation retire within the frontiers as fixed by the White decision. To this proposal Costa Rica gave her consent in a reply of March 7 and issued orders for the withdrawal of troops.

JAPAN

APOLOGY IN LANGDON CASE.—On February 22 the American State Department issued the following announcement regarding the action taken by Japan following the killing of Lieut. W. H. Langdon, U. S. N., by a Japanese sentry at Vladivostok:

"A most thorough and exhaustive examination was conducted by the court-martial, resulting in the removal from the active list of the Japanese army of Major Gen. Nishihara, commanding the Japanese garrison at Vladivostok. The court held that General Nishihara had been guilty of a misinterpretation of the barracks service regulations and had thus incurred primary responsibility for the unfortunate incident. He has been deprived of the command of the garrison and of the rank of Brigade Commander, which he previously held. The barracks officer of the rank of Major has been adjudged guilty of responsibility in the matter and sentenced to confinement for thirty days. The assistant barracks officer, a Lieutenant, and the regimental commander have both been sentenced to a similar punishment for a period of twenty days. The company commander has been sentenced to a lesser period.

"The commander-in-chief of the Japanese Expeditionary Force in Vladivostok has paid a visit to the U. S. S. *Albany* and expressed to the commanding officer of the ship his regret at the occurrence of the incident. The sentry who fired the fatal shot has been held to be excused by the orders and actions of his superiors, upon whom responsibility has been squarely placed and who are to be punished as stated. The sentry, however, was found guilty of deception in his testimony as to the circumstances of the fatality and for this has been sentenced to confinement for thirty days.

"In addition to the expressions of regret on the part of the commander-in-chief of the Japanese Expeditionary Force, the Minister for Foreign Affairs in communicating the action of the court-martial conveys to the American Government 'the expression of deep regret on the part of the Japanese Government at the occurrence of this sad event,' and expresses the hope 'that the government of the United States will fully appreciate the sincere spirit in which the Japanese Government has acted in dealing with this most unfortunate incident.'"

Secretary Colby added that the subject of reparation was still under discussion and not concluded.

"The action of the Japanese authorities has been prompt and sincere," he said. "It will undoubtedly be received with appreciation in this country."

JAPANESE CENSUS RETURNS.—Washington, March 1.—The Japanese Government has just completed the taking of the first census of Japan proper, Korea, Formosa and Saghalien. The total population for Japan proper is given as 55,961,140, but for the whole empire, embracing Korea, Formosa and Saghalien, the population is given as 77,003,112.

Japan proper	55,961,140
Korea	17,284,207
Formosa	3,654,000
Saghalien	105,765

Total¹ 77,003,112

Tokio, the capital, was supposed to approach 3,000,000 in population, but the census shows only 2,173,162.—*N. Y. Times*, March 2, 1921.

REVIEW OF BOOKS

"The Engineering Draughtsman." By E. Rowarth. Price, \$5.00. (E. P. Dutton & Co., New York.)

This work, by one of the staff of Battersea Polytechnic, is intended for students already familiar with the elementary principles of Engineering Drawing. It consists mainly of full page plates, nearly 100 in all, from drawings chosen from many branches of engineering. The subjects are all of recent date and there are examples from locomotive, marine, and stationary engine practise and from automobile, airplane and electrical machinery, etc.

Each plate has on its facing page the minimum amount of text required to explain it. Half of the text is the "Bill of Materials," or "Schedule" as they say in England, and half consists of hints as to the operation of the machine. Purposely the student is left to do the real "reading" of the drawing himself, the benefit to him being dependent on his doing so.

To teachers the work will be welcome as a mine of good subjects, carefully chosen and carefully presented. The drawings are clear, fully dimensioned, some in inches and some in millimeters.

The evidences of European engineering practise, and of English nomenclature and methods of drawing will not often trouble the American student. Usually they are easily discounted and the knowledge of how they do things in England is likely to benefit us on this side, though we may not choose to follow the example in most cases.

In adapting some of the drawings to a page of the same size as this NAVAL INSTITUTE PROCEEDINGS, views have been moved from their rightful position, but this should not trouble the mature students for whom the book is intended.

One feature of English practise, however, should be kept in mind, or the drawings will be read with difficulty. As a rule "first angle" projection has been used. To us, who habitually use "third angle" projection, most of the views are on the wrong sides of their adjacent views. Our third angle method leads to the common sense rule that the right view is to the right, the top view on top, etc. If a front elevation has been drawn already and we wish to add a view as seen from the right, we put it to the right, and so on. If we want an oblique view, as seen from the northwest corner of the sheet, we put it to the northwest of the adjacent view from which it is projected. First angle projection leads to the opposite rule. The right view is to the left and the left view to the right.

Roughly speaking, first angle projection is used consistently on the continent of Europe, third angle projection in America, and both in England.

I speak of engineering practise. In schools where descriptive geometry is regarded as primarily a branch of mathematics, first angle projection is in use here also.

In the introduction where this author explains his arrangement of views he concedes of the third angle method that "it is more convenient to use in certain cases than is the first method. As an example consider the case of the general arrangement drawing of a locomotive where, in addition to a longitudinal elevation, an end elevation looking on the smoke box and an end elevation looking on the foot plate end may be required. It is obviously easier to read the drawing if the views are arranged by Method No. 2 rather than by Method No. 1, and there are numerous similar examples of a like character which might be named."

Curiously enough, a drawing of a locomotive with the view of the head end (cowcatcher) behind the tender and a rear view of the tender in front of the cowcatcher (first angle method) was the one which caused the writer of this review, trained at school in the first angle method, to discard from his own work, twenty-five years ago, all use of first angle projection for practical engineering drawing.

Descriptive geometry was developed a little over 100 years ago in France. In theory the two methods are of equal value, and the French mathematicians chose first angle projection as the standard method, an unfortunate choice for the practical man. This is clearly a case where the theorist should adapt himself to the practical man and third angle projection should become the standard method in text books. The common sense of the practical man has made third angle projection, notwithstanding all the weight of book authority to the contrary, the standard in American drafting rooms, is overturning English practise and making some impression even in France. I hope to see it universal.

In the case of the present text book, the actual drawing work expected of the student is either the making of some details from assembly drawings, or assembling from details of parts, or designing for a slightly different size of machine. There is no reason why this work should not be altogether third angle work, and the student held rigidly to our standard method.

Students of mechanism who want to become designers, and to convert skeleton or line drawings of mechanisms into actual machine drawings will find much to learn from these plates. I refer particularly to those smaller points of design which do not lend themselves to mathematical calculation, or do not warrant treatment in works on Machine Design.

F. W. J.

"A Treatise on Airscrews." By W. E. Park. (E. P. Dutton & Co.)

This is another volume in the excellent "Directly Useful Technical Series" of books and in accordance with the plan of this series combines as much theory as it is useful to know with a very complete and detailed exposition of the principles and methods to follow in the design and construction of propellers for aircraft. The bulk of the work is essentially

practical and arranged to be placed in the hands of the student or designer who desires actually to get out a design for an air propeller.

The particular application of the "blade element" theory developed in this book and the detailed method of construction advocated are, of course, highly controversial in some of their aspects, but for the practical man who must get on with his job it is necessary to accept something on faith. This element of faith is justified by the statement by the author in his introduction that the treatment follows the methods developed by the firm of Lang Propeller, Ltd., an experienced concern.

To the general student of propulsion, the book is of interest as an exposition of the practical application of the blade element theory of the propeller due originally to Drzwiecki. This particular theory, so-called, is still incomplete in many respects but stands to-day as the only useful propeller theory available, and from it aircraft propellers have been and are being designed with very good results.

Compared with such theory of the marine screw propeller as is used in the design of ships' propellers, the marine engineers appear to be in a stone age state of development where elaborate rule of thumb still rules

J. C. H.

"L'Emden Ses Croisières et Sa Fin." By Paul Ardoin, Enseigne de Vaisseau de Réserve. (Augustin Challamel, 17 Rue Jacob, Paris.)

The cruise of the *Emden* has been described in the narrative of Lieutenant Von Mücke, the executive officer of that vessel, who has graphically related the exploits of the raider, as well as his own adventures subsequent to the loss of the *Emden*. Commander Klein's careful translation has rendered this narrative available to readers of the U. S. NAVAL INSTITUTE PROCEEDINGS. Many other articles have been written concerning the exploits of the *Emden*, but it is doubtful if readers will tire of learning new details, as well as of reviewing the old, concerning the career of the *Emden*, forming as it does one of the few bright spots in the erratic history of the German Navy in the late war.

This work of a French author presents the history of the *Emden* from a new angle, even though the book, like its companion volume descriptive of the career of Von Spee's squadron, was written while the author was in a German prison camp, and is consequently derived to a great extent from German sources.

The introduction touches upon the active and efficient services rendered by the *Emden* in Chinese waters before the declaration of war. A few paragraphs are devoted to describing the character of Von Müller the captain of the *Emden*, contrasting it with that of Von Spee, somewhat to the disadvantage of the latter, so far as the qualities of energy and determination are concerned. There follow many quotations showing the high opinion and regard held by the crew of the *Emden* for their captain's tireless energy and ability. Tribute is also paid to Von Mücke, with particular reference to the great ability displayed by the latter in taking an unseaworthy sailing vessel like the *Ayesha* from the Cocos Islands to Hodeida.

The history of the *Emden* is then traced from the news of the declaration of war and the first prize, captured just off Tsing-Tao.

Shortly thereafter the *Emden* was ordered to rendezvous with Von Spee's squadron at the Marianas Islands, but at Von Müller's own suggestion he was given permission to proceed on detached duty, and thereupon began the *Emden's* three months' highly successful career as a raider.

The German cruiser was rendered easy to identify by the fact that she had three smokepipes whereas similar vessels of the British navy had either two or four. Consequently, a dummy smokepipe was rigged, which could be hoisted and lowered at will, making the *Emden* greatly resemble a British cruiser of the *Yarmouth* class.

The first important prizes were captured in the Bay of Bengal. It was Von Müller's practice to sink his prizes, retaining the crew of each on board the *Emden* until a certain number of men had been assembled, when he saved one prize from destruction and sent all his prisoners on that vessel to the nearest neutral or enemy port. For all vessels destroyed and for all merchandise taken over he gave receipts. Officers and men who were his prisoners praise highly his courtesy and his considerate treatment.

In order to obtain news of enemy merchantmen and neutral vessels carrying contraband it was his practice to lie off a port and listen in with his radio for messages. He also learned a great deal about the movements of ships from indiscreet remarks of some of the shipmasters who had been captured. He used his radio at times to misdirect his contemplated prizes and bring them within the radius of operation of his own ship.

After his exploits in the Bay of Bengal, Von Müller stood into Madras and shelled the large oil tanks the British owned at that place. Although a few private houses were hit, the bombardment of Madras was sanctioned by international law because the main objective was the destruction of the large fuel oil depot. From Madras Von Müller proceeded to Colombo, Ceylon, where he sank four English ships. At this time no less than sixteen men-of-war, English, French, Russian and Japanese were pursuing the *Emden*.

The chase was becoming too hot, so, leaving the main shipping routes, Von Müller put in to the British island of Diego Garcia, situated in the Indian Ocean between Mauritius and India. Here there were but two mails a year; consequently the governor did not know that war had been declared. No sooner had the German raider anchored than the governor went out to visit her, bringing many presents of fish, eggs, fruit and other supplies, stating that he was very glad to see a German ship in port, since this was the first visit since 1889, when relations had been very pleasant. After leaving Diego Garcia, the *Emden* captured another English merchantman whose master disclosed the fact that he was following the new routing instructions. Soon afterwards, thanks to this information, the *Emden* captured and sank six vessels in rapid succession.

All this time the British press, although admitting that Von Müller was acting strictly in accordance with the laws of war, was vigorously

attacking the Admiralty because the allied navies had been unable to capture or destroy the *Emden*.

At the very time that the criticism of the British press happened to be the most severe, the *Emden* dashed into Penang and torpedoed the Russian cruiser *Jemtschoug*.

The French gunboat *D'Iberville* opened fire, but the *Emden* escaped and sank a French destroyer, the *Mousquet*.

Von Müller then planned an attack on the radio and cable station at the Cocos Islands. Von Mücke, the executive officer, was sent ashore with a landing force to destroy the radio station. The Australian cruiser *Sydney* received a despatch giving notification of the arrival of the *Emden* at the Cocos Islands, but was unable to intercept the raider before Von Mücke had destroyed the radio station and made an unsuccessful attempt against the cables.

When he realized the near approach of the *Sydney*, Von Müller signalled his executive officer to return, but the latter found it impossible to comply with these orders.

The *Sydney* was superior to the *Emden* in speed and gun power. After a gallant fight, Von Müller finally beached his ship on North Keeling Island, and at last surrendered in order to save the surviving members of his crew. In view of the gallantry displayed by the *Emden*, the surviving German officers were allowed to retain their side arms when they were taken on board the *Sydney*.

Von Mücke and his landing party, unable to return to their ship, watched the action from the island. At its conclusion Von Mücke and his men embarked in the old three-masted schooner, *Ayesha*, and decided to attempt their escape in that vessel. Navigational instruments and charts were old. The men were without proper clothing. Food and water were scarce.

However, despite these and other difficulties, Von Mücke and his men made Padang, a port of Sumatra, where they took stores and remained for twenty-four hours. At Padang they found the *Choising*, a German merchantman which had been detailed to act as a collier for the *Emden*. After leaving Padang, en route for the Gulf of Aden, the *Ayesha*, in accordance with a pre-arranged plan, fell in with the *Choising*, and to this steamer Von Mücke transferred his men. The *Choising* passed through the straits of Bab-el-Mandeb and finally arrived at Hodeida, and thence, after many adventures, Von Mücke and his men made their way overland to Constantinople.

The book is written in the same easy style as its companion volume describing the career of Von Spee's squadron.

Even though officers are familiar with Commander Klein's translation of Von Mücke's work, a perusal of this volume will be of benefit for reviewing from the standpoint of a French naval officer, the exploits of the *Emden*, which are well worthy of careful study.

N. R. V.

"The Crisis of the Naval War." By Admiral Jellicoe. Price, \$7.50. (George H. Doran Company.)

This interesting book is the complement of his first volume, "The Grand Fleet, 1914-1916." Admiral Jellicoe, the one man who was best situated to know, now draws aside the curtains and reveals to us the efforts made by the Admiralty to overcome the threat made by the German Submarine Campaign. The account not only deals with the origin ashore of the defense and offense against submarines, but follows to sea the measures adopted where their application and results are shown.

The first chapter deals at length with the changes made in the admiralty that the organization might be logical and smooth working to avoid conflict of authority, to have no necessary service neglected, to provide the necessary corps of investigators of new devices, and above all to free the first Sea Lord and his assistants of a mass of detail that their efforts might be concentrated on the larger questions.

The appendices are of value and interesting because they show the organization at different periods and emphasize the fact that the Naval Staff at the end of the war was the result of trial and error, natural growth, and at least one radical change adopted during war.

Chapters II and III deal with the Submarine Campaign in 1917 and the measures adopted to win success. The gradual naval control of all merchant shipping with its attendant difficulties is clearly shown. The tremendous labor involved in putting into operation new measures; the unremitting search for and development of new anti-submarine devices is revealed, and above all the length of time necessary to put into operation any new device, and this when time is the most precious element, is pointed out.

That a campaign against the enemy must be waged with every means at hand; that new weapons must be continually sought; that no "cure-all" by which the enemy may be defeated without fighting can be expected; that during war is the poorest time to provide the material which should be provided during peace, the Admiral shows in a manner not to be gainsaid.

Chapters IV and V deal with the testing, introduction, and gradual growth of the Convoy System. It is shown how the introduction of this system was delayed by lack of vessels to perform escort duty and why when finally adopted it was so successful because it was not only defensive but offensive in that it meant a fight for a submarine to attack a vessel under convoy.

Chapter VI is devoted to the entry of the United States. The accurate estimate of our naval strength by both the enemy and the allies, and our inability upon the declaration of war to lend any great assistance are shown—and this at the most critical period for the Allies—a period when the German submarine campaign was at its height, when the tonnage lost monthly by the Allies was far in excess of what could be replaced—when the destruction of merchant shipping if continued at the then present rate would in a few months mean the defeat of the Allies.

The close cooperation between the British and United States leaders and forces with the resultant benefit to both is explained in detail.

The remaining chapters treat of patrol craft and mine sweeping services; the Dover patrol and Harwich forces; the sequel; production during 1917; the future.

The tremendous labors, "carrying on" under adverse conditions, disappointments and successes of the different forces are given full credit and a just appreciation by their leader. One heaves a sigh of relief when he reads "The Sequel" in which the ultimate success over the enemy submarines is gained as the result of prodigious efforts carried out under the most heart breaking conditions.

No one interested in the naval campaigns of the Great War should fail to read this book, and learn therefrom.

T. L. J.

"Old Naval Days." By de Meissner. Price, \$3.00. (Henry Holt & Co.)

In this pleasing account of the life of one of our well-known naval officers, whose services extended from 1825 to 1872, we are introduced anew to most of the naval heroes and many other noted men who had large parts in the upbuilding of our United States.

The story of Admiral Radford's life is interwoven with delightful sketches of life in St. Louis and Virginia during the early part of the century; the Lewis and Clark expedition; the naval actions during the War of 1812 and against the Barbary Coast; the conquest of California; the Mexican and Civil wars. To read this book is a pleasant way to review much of the history of the United States during its period of growth.

T. L. J.

"Modern Marine Engineering. Part I: 'The Fire Room.'" By Harry G. Cisin, Marine and Mechanical Engineer. Price \$3.00. (Published by D. Van Nostrand Company, 8 Warren Street, New York.)

As stated in the preface, the purpose of this book is: "To reflect present day practice." While intended primarily as a text-book for schools and colleges, it has been adapted to the needs of the practical man who desires to broaden his knowledge and to advance himself in his profession. The language is clear, readable and simple so that it is practically self-instructing. The subject matter is fully discussed in chapters with a complete set of questions at the end of each chapter.

This volume "I: The Fire Room" contains a detailed discussion of the following subjects, marine boiler construction (fire and water tube), various water-tube boilers, and also sections on boiler-room auxiliaries, boiler corrosion, fuels (coal and oil), and combustion. A detailed description of the construction of a B. and W. boiler is given while only general descriptions of express type boilers are given. For the more advanced student the final chapter discusses the general theory, calculations, and the steam tables.

The book is illustrated by 66 illustrations which are very clear and useful. There are a few inaccuracies where illustrations do not agree with text but it is presumed these will be corrected in the next edition. The construction details shown in these illustrations should be useful to marine engineering draftsmen, as well as to others engaged in marine engineering construction.

The 192 pages of text are fully indexed. Also an index of the illustrations is furnished.

W. L. F.

"The Theory and Practice of Aeroplane Design." By Andrews and Benson. Price, \$7.00. (New York: E. P. Dutton, 1920.)

If the title were less comprehensive and if the preface did not promise so much, one could say that this is a useful reference book to add to the library of an experienced aeronautical engineer. However, its claim to supply a text of both theory and practice falls very short of adequate realization.

The theoretical side is especially weak. In particular the book is almost silent as to the fundamental laws of aerodynamics. The theory of structures given in the chapter on wing strength is rather sketchy and all but ignores the part played by the stagger wires. The stability theory given is largely a reproduction in abstract of matter published before 1917. This last is hardly illuminating, as the practical application of this highly involved mathematics has yet to be made. The authors make no attempt.

On the whole, the book does give a fair idea of how some British airplanes may have been designed in the past. However, it is hoped that in future airplane design will have a more straightforward procedure, and it is to be regretted that the authors have not attempted to digest the vast quantity of experience and data available. The book is in no sense a text suitable for teaching and could be much improved by a 50 per cent condensation of what is given.

There is unfortunately still no text in English fairly comparable with Professor Pröll's "Flugtechnik."

J. C. H.

"Subject Index to Periodicals, 1917-1919." Issued by the Library Association, 33 Bloomsbury Square, London. List "B-E," historical, political and economic sciences.

This publication is the English "Reader's Guide to Periodical Literature," with the difference that instead of combining references to all the arts and sciences in one alphabetical arrangement and in one volume, as does Wilson's Reader's Guide, the English index is issued in separate "class lists." The list received by the Institute, List "B-E," historical, political and economic sciences, is that containing references to articles on the military and naval sciences. This method of listing references, while used to some extent on this side of the water, has drawbacks as distinct as its advantages, the chief inconvenience being that the user is

frequently uncertain whether or not he has the proper class list in hand, whereas Wilson's method puts it all together in one volume. True, if you are interested mainly in theology, you do not have to pay for thousands of references to music, or archæology, or fine arts, but who knows in what subject he will become interested tomorrow? For the matter covered, the present subject index is an admirable and accurate guide to what has appeared in the leading English, American and French periodicals, literary as well as technical and professional, during the three year period 1917-1919, and makes accessible to officers of the service a tremendous amount of valuable matter of close professional interest. More than four hundred periodicals carrying articles within the scope of the guide are covered, among them being the U. S. NAVAL INSTITUTE PROCEEDINGS, making the guide almost indispensable to one seeking material on any of the subjects covered in its classification. The index is a classified one merely, which is another way of saying that titles of articles and authors' names will not be found elsewhere than under the proper classified heading, although the Association publishes a general name index to the seven different class lists. The bulk and unwieldiness of the list, arising from the use of rather thick paper and large type are amply compensated for by the pleasing typographic effect of the printed page. It is evident that much care and thought has been given to the method of classification which is, in the main, clear and readily understood after a short examination. The compilers deserve encouragement from both arms of the service in the publication of this bibliography which will save time to many an inquiring officer seeking material on recent developments in his profession. The subject list will be kept on file in the office of the Naval Institute and will be available to any officer desiring to make use of it. A considerable number of the periodicals indexed will be found in the Naval Academy Library.

J. M. S.

"A Handbook of Practical Shipbuilding with a Glossary of Terms." By J. D. MacBride. Price, \$3.00. (Published by E. H. Van Nostrand Company, New York.)

This is a second edition of a book which was first published in the latter part of 1918. The new edition contains additional information and more comprehensive treatment of some subjects. The author was Superintendent of Hull Construction at the Hog Island Shipyards, and in connection with construction work in hand there, and at other yards, that was being undertaken by a force of men, on the whole, inexperienced in modern steel ship construction, the need was felt for a guide or set of instructions explaining in detail the methods followed in assembling and fastening the various parts of a ship and the tools and appliances used in its construction.

The general organization of a shipyard is first discussed, then a chapter outlining in considerable detail the duties required of the several classes of workmen at the building ways is followed by one describing with numerous illustrations the shipyard tools. Then follow chapters on Keels,

Shell Plating, Floors, Framing, and the other major elements of the ship, together with very practical chapters on Stopwaters and Testing; Launching is briefly treated; and separate chapters are devoted to Engine and Boiler Room Installations; Auxiliary Machinery; Piping Systems; Hull Engineering; and Dock Trials, all intended to cover the subjects treated in a general way so that the workmen may have a general knowledge of what is involved in completing the ship.

The book covers the work done at the building ways, work done in actually putting together the various parts of the ship which have been fabricated "elsewhere." It has been prepared as a result of the very extended and varied experience of the writer in practical shipbuilding and while intended primarily for "green" men, contains much information of a practical nature for those with more experience.

W. G. D.

"Simple Rules and Problems in Navigation." By Charles H. Cugle. Price, \$5.00. (E. P. Dutton & Co., New York, N. Y.)

This book is a good one for the instruction and training of merchant navigators who attack the problems of navigation without the benefits of a previous study of mathematics and astronomy. It is devoted to practical examples which may be used as guides. The data furnished can be used to advantage by naval officers studying for promotion particularly as the answers are brought up to the 1921 almanac.

The method of running the morning line up to noon commonly used in the navy, should have been included as it is simpler and better than the method of latitude and longitude, differences illustrated. In this connection it is noted that the author calls a line drawn at right angles to the bearing of a heavenly body, a "line of bearing." The generally accepted name for such a line is a "line of position."

The rules of the road and other similar information which is included enhances the value of the book for men going up for licenses.

A. M. R. A.

"Manpower." By Lincoln C. Andrews, author of "Military Manpower," "Basic Course for Cavalry," etc. (E. P. Dutton & Co., New York.)

The author, in his foreword, states the purpose of his book to be the adaptation of the ideas and methods so successfully employed in military training and leadership to the uses of civil life.

He states it to be his belief, and his views are undoubtedly correct, that the fundamental principles for handling men are universal in application, that is, we are in all cases dealing with *men*.

He regards leadership as an art, not an exact science, wherein the leader's impulses are right and these impulses come from a genuine acceptance of principles, from one's own beliefs, feelings and experiences. In other words, for the leader it is a question

(1) Of personal understanding and sincerity of purpose to play the game fairly;

(2) Of having a sympathetic understanding of the human animal and of what the laws of life make him do under certain circumstances; and

(3) Of having an appreciation of one's own personality and how it affects others.

The book is in three parts:

I. Using Human Tools.

II. Psychological Elements of Organization.

III. The Principles of Leadership.

The author's treatment of his subject is throughout based on *quality*, not quantity, of manpower—how to handle men to effect that willing response which is the only true discipline. His book will be very helpful to all who have long known that the proper handling of men was necessary for the highest efficiency—and have not yet found any practical ideas as to *how to do it*.

Part III, in particular, contains numerous items of advice that can with profit be learned and pondered well by all whose duties call upon them to supervise their fellowmen.

E. J. K.

"Little History of the Great War." By H. Vast, Translated from the French by Raymond Weeks, Professor, Columbia University. Price, \$2.00. (Published by Henry Holt and Company.)

This book is called a "Little History," and covering, as it does, in about two hundred and fifty pages, a subject of the magnitude and importance as that of world happenings during the period August, 1914 to November, 1918, it is necessarily condensed and treats only of the principal individuals and the most important campaigns and events.

The book first appeared in Paris in November, 1918, and was intended to present a concise statement of events leading up to the conflict, an outline of Germany's long preparation for war, her perfidy, and a popular treatise of the military operations in all theatres. It does not pretend to be a technical or scientific history of the war, but has been written, as the author states, more from information obtained from articles appearing in the public press than from official documents. There are numerous maps that help out the text covering the subjects under discussion, and while some inaccuracies appear, probably due to the sources from which information has been obtained, the data as a whole appears reliable and is presented in a logical sequence.

Naval operations are but very briefly mentioned, the greater portion of the book dealing with the political and military aspects of the war. The subject is one of too great magnitude to be covered in a book of this extent, except in a very brief way, but for preliminary reading to add to one's general knowledge or to help clear up the maze of ideas about the war, and events connected therewith, prior to a more extensive or detailed study thereof, this little book will undoubtedly be found both interesting and instructive.

W. G. D.

"A True Account of the Battle of Jutland." By Captain T. G. Frothingham, U. S. R. Price, \$1.00. (Published by Bacon & Brown.)

The heated controversy raging in England over the tactics and results of the Battle of Jutland appears to have divided British opinion into two opposing factions; the one *pro*, the other *contra* Jellicoe. This is not surprising when one recalls the gloom which followed upon Mr. Balfour's announcement of the losses sustained in that action and his colorless statement of achievement.

When the British public learned that the two fleets had come into actual contact, with the superiority on its own side, it naturally expected a repetition of the days of Nelson, and it was bitterly disappointed, if not shocked, when, later, the negative outcome became known. In consequence, there are now two schools of naval thought in Great Britain. The first strongly condemns the Admiralty of that period for lack of preparation in certain essentials; for a false doctrine of the rôle the navy ought to play; and for trusting too much to material and too little to men and morale, while not sparing the commander-in-chief because he did not possess or exhibit that traditional spirit of the offence which brought victory to Drake, Hawke and their successors. Although bearing witness to his candor, integrity and character, this school holds him personally responsible for allowing to slip through his fingers the greatest naval triumph of all time. The second school seeks to explain that Jellicoe was right; that he could do no differently, in the light of his information on that eventful May day, in 1916, and of the policy he was directed by the Admiralty to carry into effect.

Under the circumstances, any account of the action by British hands, however competent, cannot escape the implication of prejudice; hence it is to foreigners that we must look for studies devoid of bias. Such are Lieut. Commander Frost's "High Sea Fleet at Jutland," (U. S. NAVAL INSTITUTE PROCEEDINGS, Nov., 1920); Commander Gill's "What Happened at Jutland," and Capt. T. G. Frothingham's "A True Account of the Battle of Jutland." The latter is under particular consideration in these lines.

In this connection three questions present themselves at once. "Is the author fair minded and capable?" "Are all available facts employed by him in reaching his conclusion?" "Are there sufficient known facts to warrant his reaching any conclusion at all?" A careful reading of Capt. Frothingham's text supplies an affirmative answer to the first and second queries mentioned. As to the third, it may be safely assumed that, thanks to the British official report and to the books, however *ex parte*, of Jellicoe, Scheer, von Tirpitz, etc., nothing of vital importance remains to be told of the main course of events. Doubtless many minor occurrences may yet be made public, but none, it is likely, to affect materially the general estimate held by the author.

He describes the military and naval situation just prior to the action, the practices adopted by the rival commanders-in-chief and their respective aims. His story of the battle must be substantially correct, since it is based on unquestioned records and is in agreement with the accounts given

by Frost and Gill. It is well worth the reading for it is both terse and clear. Of especial interest to the profession are the sudden changes of course by Scheer, "vessels right about," a difficult and frequently rehearsed movement which baffled Jellicoe at three critical moments of the fight.

The author gives generous space to Jellicoe's utterances, official and personal. His criticisms are few in number and not caustic, although he does not share the general laudation of Beatty's tactics believing that the latter should have kept Jellicoe better informed, especially as to the location and heading of the Germans and that he should have made more use of his fast battleships under Evan-Thomas. The author's most serious charge, based on Jellicoe's expression, is "not alone the lack of modern methods in range finding and director fire control, but in preparation for action under night conditions." Whether these deficiencies could not have been made up by a more resolute determination to close with the enemy at all costs is a question which will never be answered. Again, he uses Jellicoe's own words to point out, tacitly, that the British admiral seemed more intent on avoiding injury to his vessels than to engage the enemy at close quarters, and push the fight to a finish—a reluctance founded largely on dread of torpedoes and mines.

The importance of accurate and timely intelligence is accentuated by the unexplained error of twelve miles in Beatty's position which caused Hood to miss him and greatly embarrassed Jellicoe in his efforts to join his subordinate.

It is no part of these comments to recount the incidents of what might have been a second Trafalgar. Rather, are they meant to call the attention of our readers to a story of the clash of the two greatest armadas in all history, an account which can be accepted as conscientiously exact. Indeed, it will be found exceedingly valuable in providing a general *coup d'œil* of the engagement for those who purpose, subsequently, to go deeper into its details.

C. F. G.

"What Happened at Jutland." By Commander C. C. Gill, U. S. Navy. Price \$3.00. (George H. Doran & Company.)

"The action was indecisive. Therefore, it had no decisive influence upon the naval situation or the general course of the war."

This the judgment of Commander C. C. Gill, U. S. N., the author of "Naval Power in the War," and well known as a qualified analyst of naval affairs.

Commander Gill has critically examined the tactics employed by the parties of the first and second parts of the Battle of Jutland and finds that, although the engagement ranks with the greatest battles in history, the fact is not generally realized as the action was not decisive. The result is that this contest, which was the only major fleet engagement throughout the entire war, in the opinion of Commander Gill, had no effect on its course.

In his study of the battle, the author has used every reliable source of information including official reports and the books by both commanders-in-chief in which Jellicoe and Schöer fully discussed their maneuvers and described the battle from their respective viewpoints.

With this material, Commander Gill has made an impartial survey, filling in the gaps which must of necessity obtain in the movements of the forces; has graphically analyzed each phase of the contest; and has reached an unbiased conclusion as to results, both in regard to the major tactics employed and in detail as to types engaged.

This interesting work begins with the strategic disposition of the fleets before the battle and discusses the tactics of the battle itself in five phases from the encounter of the advanced forces under Beatty and Hipper through the withdrawal of Jellicoe to the southward that night. The series of 26 diagrams of formations and maneuvers which accompany the text are distinct contributions to the graphic narrative and will be invaluable to students of this momentous contact of giant fleets. Included in an appendix is a summation of the losses and damage to individual vessels on both sides and also excerpts from an authoritative paper prepared by Rear Admiral Taylor, the Chief Constructor of the navy, entitled "Design of Warships as Affected by Jutland."

Commander Gill's conclusions will be given respectful and widespread attention, as many important questions of future naval policy and design will undoubtedly be based on the experience of Jutland.

"What Happened at Jutland" should be read by every line officer of our service.

W. T. C.

"A Treatise on Hand Lettering." By Wilfrid J. Lineham. Price, \$7.00. (E. P. Dutton & Co., New York.)

The author of this work will be remembered by many naval officers as the writer of a work on mechanical engineering which was used as a text book at the Naval Academy for many years, before Barton's Mechanical Processes was written. Prof. Lineham is head of the Engineering Department of the University of London, Goldsmiths' College.

The book is published "for engineers, architects, surveyors and students of mechanical drawing" and is one of a "directly useful technical series" edited by Prof. Lineham, a series intended to "occupy a midway position between theoretical books and severely practical ones."

The plates of lettering number about 110 of 6" x 10", and there are half a dozen large folders showing the application of lettering to technical drawings. The hand work and the work of reproduction are excellent. I do not see how they could be better. The lettering which is to serve as a model for practise by copying, varies from 1/4" to 1" in height, since large scale lettering is always advisable for the novice.

A third of the plates are what the author calls Block Capitals, either Italic or Vertical, with American Italic or Vertical Smalls. This combination is what we are familiar with in this country under the name of Reinhardt, or one stroke lettering. Officers and engineers in general, if in a position to require examples of fine lettering as models, will find these of use. They have the severity and dignity which suits technical drawing, together with the power of great photographic reduction without loss of legibility.

Another third of the plates is devoted to Roman Italic and Roman Vertical Capitals and Smalls. These will be of value to architects and surveyors.

The remaining third is devoted to types of use only to specialists, such as decorators, poster designers, movie film writers and the like. The examples keep in curb the common tendency to over-ornamentation and over-exuberance. It is to be hoped that such letterers may get this book and use it.

While this work may be called a "midway" book in England, in this country there will hardly be a demand for any more theory in this subject. Good taste is the criterion and it is a subject which does not lend itself to theory very well. The value of the plates is all in their good taste and fine workmanship.

T. W. J.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE. 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,

Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

- "Rebuilding the Navy's Enlisted Personnel, and Reestablishing Its Morale and Spirit After the Serious Slump Caused by Too Rapid Demobilization and High Wages in Civil Life."
- "The Human Element in the Administration of Discipline."
- "A Demobilization Programme for the Future."
- "The Mission of the Naval Academy in the Molding of Character."
- "Health of Personnel in Relation to Morale."
- "Physical Factors in Efficiency."
- "The Naval Officer and the Civilian."
- "Naval Bases, Their Location, Number and Equipment."
- "Military Character."
- "The Ability to Handle Men a Necessary Element in the Equipment of a Naval Officer."
- "The Relation of Naval Communications to Naval Strategy."
- "The Relation of Naval Communications to Naval Tactics."
- "The Training of Communication Officers."
- "The Organization of a Naval Communication Service."
- "The Naval Policy of the United States."
- "A Review of the Battle of Jutland with Lessons to be Learned Therefrom."
- "Modification in the Design and Armament of Ships to Meet the New Conditions of Aerial and Subsurface Attack."
- "Coordination of Surface, Subsurface and Aerial Craft in Naval Warfare."
- "Our New Merchant Marine."
- "Submarine Warfare, Its History and Possible Development."
- "Escort and Defense of Oversea Military Expeditions."
- "A Proposed Building Programme for the U. S. Navy, Including an Efficiency Air Service."
- "Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation."
- "The Ship's Company—Its Training, Discipline and Contentment."
- "The Principles of Leadership of Naval Personnel."
- "Morale Building."
- "The Value of Facility in Exposition—Verbal and Written—for Naval Officers."
- "Discipline as Affected by the Human Relation."
- "The Value of Pep."
- "Navy Spirit—Its Value to the Service and to the Country."
- "The Influence of the Term of Enlistment on the Efficiency of the Service."
- "The Principles upon which Should be Founded the Freedom of Neutral Shipping on the High Seas."
- "The Fighting Fleet of the Future."
- "The Future of the Naval Officer's Profession."
- "The Navy: Its Past, Present and Future."
- "The Navy in Battle: Operations of Air, Surface and Underwater Craft."
- "Shall I Remain in the Navy?"
- "Psychology and Naval Efficiency."
- "The Naval Policy of the United States in the Light of the Peace Treaty."
- "Scope of Naval Industrial Activity and the Navy's Relation to Shore Industry."
- "The Pacific Theater."
- "Was Germany's Coast Impregnable?"
- "Future Development of the Naval Shore Establishment."
- "America as a Maritime Nation."
- "Arguments for and against the Restriction of the Manufacture of Munitions to Government Owned Factories."
- "The Present Rule of Neutrality regarding Contraband and Blockade—Is it Justifiable in Ethics or in Expediency?"
- "The United States Navy and the League of Nations."
- "Is a League of Nations Navy Desirable?"
- "The Adaptability of Oil Engines to all Classes of War Vessels."
- "The Place of Mines in Future Naval Warfare and the Rules under which Their Use Should be Allowed."
- "The Use and Abuse of the Doctrine of Continuous Voyage."
- "The Question of the Future Use of Submarines."

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CONTENTS

LEADERSHIP. By Captain R. Drace White, U. S. Navy.....	655
THE STRATEGY OF THE WORLD WAR, AND THE LESSONS OF THE EFFORT OF THE UNITED STATES. By Captain Thomas G. Frothingham, U. S. R.....	669
THE PLACE OF NAVAL OFFICERS IN INTERNATIONAL AFFAIRS. By Lieut. Commander G. B. Vroom, U. S. Navy.....	685
THUCYDIDES AND SEA POWER. By Captain J. M. Scammell, Inf. R. C..	701
NAVAL WAR COLLEGE. By Rear Admiral Wm. S. Sims, U. S. Navy...	705
A NEW METHOD IN COASTAL NAVIGATION. By H. B. Goodwin.....	723
DISCUSSION	731
SECRETARY'S NOTES	737
PROFESSIONAL NOTES	741
NOTES ON INTERNATIONAL AFFAIRS	792
REVIEW OF BOOKS	803
INFORMATION INDEX	739

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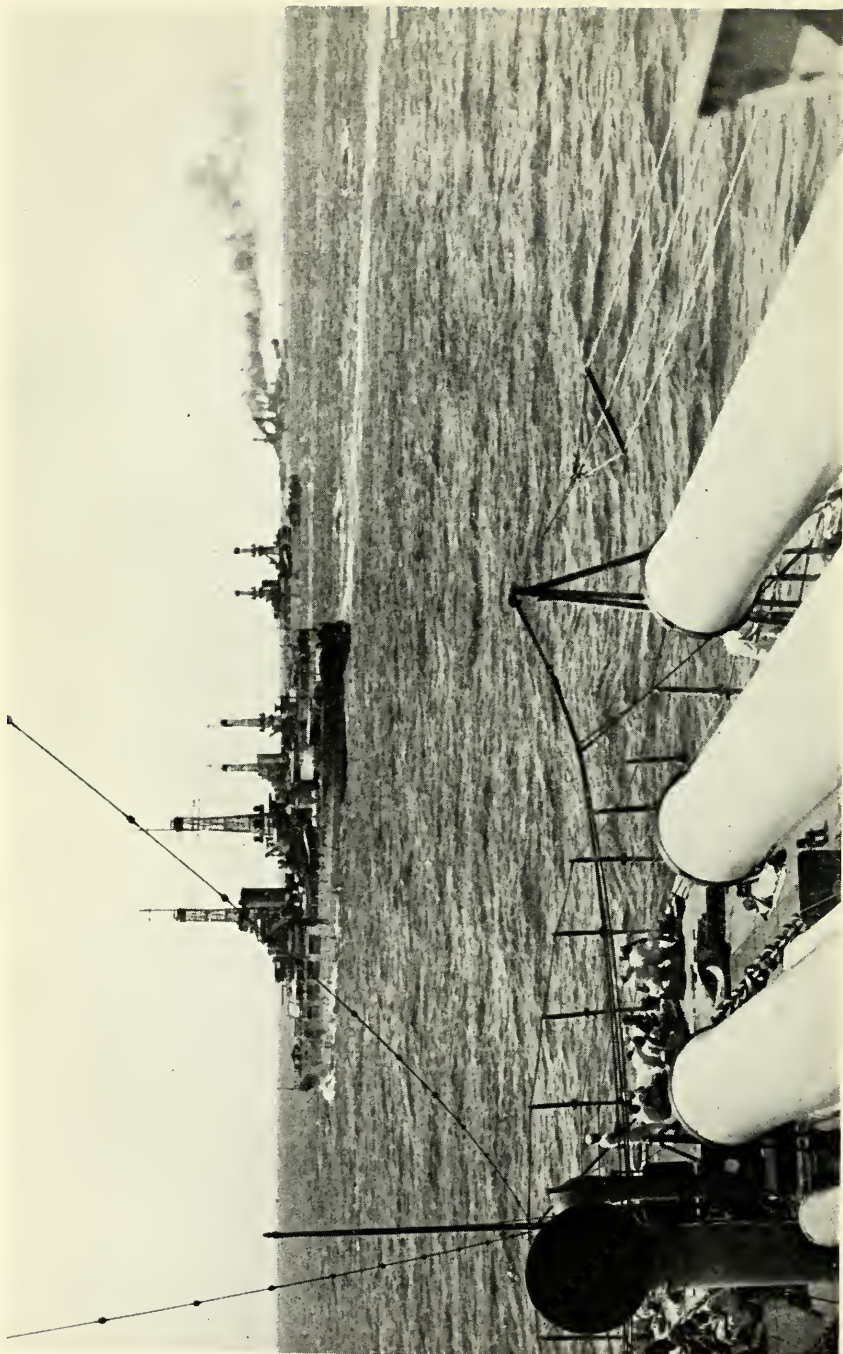
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THE FLEET AT SEA.

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LEADERSHIP

By CAPTAIN R. DRACE WHITE, U. S. Navy

Motto: Only the master shall praise.

Leadership is that quality which, exercised consciously or unconsciously by one person, inspires in others an impelling influence to conform to the former's will. It is frequently, though not necessarily, a heaven-sent gift. It is closely associated with and generally, though not invariably, strengthened by the exercise of command. It is generally, though not always, born of strength of character—that virile father of villainies and virtues alike. It is the foundation stone beneath the middle of the pyramid we call our career; and even as the central stone is more heavily weighted than its brothers as the pyramid grows higher, so as we advance in our career more support is demanded of the quality of leadership than of any other on which our worth is based.

Whimsically speaking, *leadership is the art of getting the other man to do it*; more seriously, that of marshalling and turning to profit the energy and capabilities of others. It is that which distinguishes the captain of the smart ship, whose officers and men are quick and sure to do his bidding, from the one who, although a master in the details of his profession, fails of the touch necessary to exact hearty co-operation from his subordinates. It is that which distinguishes the worth-while petty officer, whose squad works and drills responsively and effectively, from the unpromising

one, who, although capable and willing to do the work of ten men by himself, gets nothing from his men as a unit.

There is a fascination in doing things with our own hands. There is the joy of undivided authority of our successes; the relief from unhappy bickerings frequently present in divided though correlated effort; and the absence of suppressed (or open) recrimination in case of failure. Then there is the inclination prone in all of us to believe that we can do anything in our profession (sometimes in any profession) better than anyone else. Although this belief is frequently bereft of fact, I should hesitate to condemn a minor egotism so productive of laudable pride. However, sooner or later, if we are to remain worthy of our wage, our inspirations must find expression in the efforts of others. Sooner or later excessive devotion to detail would rob us of the application we, in our advanced authority, should owe to direction. It is well, therefore, that we should whenever practicable apply ourselves to the duties that furnish experience in handling men, or, synonymously, in leadership.

This, the young officer, tempted by the lure of trifling, though independent, duty or localized specialization, should keep well in mind. The "ace" who has downed his several enemy, fighting entirely alone, may fail utterly of his ends when, in later and more complex responsibility, success will depend entirely on his inspiration and guidance of others.

I have said that to some of us this quality comes as a gift. "Born Leader" is a term that has been applied to great geniuses at arms from time immemorial. That there are many who come by leadership through inheritance no one can deny. But it is equally true that it is much less frequently inherited than is commonly allowed. The term "born" in this connection is generally used, not so much in its literal sense as in laudation—simply to glorify the quality thus ascribed. Curiously enough, investigation will show that in most cases the appellation fails truthfully to describe the character of the man to whom it is applied, and, far from exalting him, robs him of a credit that should rightfully be his—credit for fighting to acquire a quality difficult of acquisition; credit for much abstinence, much self repression, much plodding and in general much self discipline.

How many of the unthinking regard Napoleon, for example, as a "born" leader! How many would be surprised at the pronounce-

ment of Major General David C. Shanks, an authority on Napoleonic data: "There is a widespread idea," writes the General, "that a great leader like Napoleon is the heir to a heaven-born gift that raises him beyond the level of all his contemporaries. But let the truth be known for all who are willing to attain eminence as Napoleon attained his—by hard work. In his youth that which distinguished Napoleon from his fellows was his constant reading, his habit of taking notes, and his power of application. Success came to Napoleon as it comes to most officers, through constant endeavor." There is no doubt that Napoleon's capacity for the acquisition of great principles and the disciplining of his character to the proper exercise of his powers was equal to the demand. It is no doubt true that he was blessed with an inherent genius that facilitated the process of acquirement, and the later exercise, of these powers; but there are doubtless many others, who, though equally blessed in capacity, neglect to apply themselves to the problem as he did, and thereby forfeit the success their capacity should rightfully entitle them to.

As a matter of fact, Napoleon's genius may not have been born to him any more than his quality as a leader. That also may have been acquired by his own efforts. Genius may be described as a state of the mind as regards receptivity and activity, and who can say but that this state of mind may not be improved by culture and training as can practically every other capability we possess?

However that may be, let not genius be confused with leadership. Although a necessary attribute to it, it is only a part of it and can never be a substitute for the thing itself. It is at best leadership's most faithful ally, its strong right arm. Do not despise genius because of its secondary rôle. Do not despise it even when it verges on the visionary. "It is generally supposed," writes Brailsford, "that idealists have a monopoly of illusions. Those of the practical man are as fantastic and they are commonly duller." Do not let your anxiety for poise rob you of imagination. In your level headedness you may just lack that fire, that dash, that imagination necessary for you to inspire those you would have follow you. And be it remembered, none can claim leadership in its truest sense unless he actually does inspire. *A man without dash is never a hero to his fellow men, and one without imagination cannot hope to rise above the mediocre.*

Similarly, a man without a sense of humor may be safely regarded as a total loss. It is far from necessary that he view everything in lighter vein, he must be careful not to offend by making jest of what to his fellow man is vastly serious. He must beware of laying claim to the title of "king's fool"; but he, who would lead, must have the faculty of throwing off his cares when opportunity offers—making the opportunity if necessary—and being *human* in his contact with others. No one, save Atlas, ever shouldered the whole world's troubles alone.

I have said that leadership may be exercised consciously or unconsciously. I believe the true leader must be capable of exercising it both ways. A self conscious man must sooner or later fall victim to timidity. Nothing can be more inimical to a leader's hold on his followers than a pervading sense that he is acting something that he is not; that he is unbelieving in himself; that he is, in short a *poseur*, a cheat, an impostor. He must not only forget self in his claim for response but he must avoid any appearance of self consideration or self seeking.

In this particular it would seem that the leader by inheritance would have an immense advantage over the leader by acquirement. Men tend to believe that the thing which was will be, that the thing which in vain has struggled to become a fact must remain a dream forever. It is therefore difficult for one who has never shown any capacity for leadership suddenly to exhibit it. But it is not impossible. The capacity to lead may have been ever present though dormant, or perhaps lacking opportunity for application. If the capability is there, if the one who would exercise it has unassailable faith in his cause, if he in his undertaking clothes himself in that all-enveloping *will to win*, he need feel no fear from the deterring influence of his past obscurity. Inspiration, if he be properly interested, will drive from his heart all consciousness of inferiority and what is in his own heart must eventually get into the hearts of others. There is a complete mastery that comes from a fixed idea, not a reasonable but an emotional mastery, a sort of concentrated exaltation. Under its empire men rush blindly through fire and water and opposing violence and nothing can stop them. Under its spell opposition fades and obstacles vanish. How futile then to deter is past obscurity if one is sufficiently absorbed in present devotion!

There is no question but that the exercise of leadership augments one's capacity for it. The experienced officer can get results

where the inexperienced will fail. But this is true only and in equal measure as it is true in every other art. Every one must begin at the beginning. Give the young man his chance. Give him responsibility and see him acquit himself of it. Leave the detail of division work to the division officer and see him "eat it up." Don't be afraid of letting him get beyond you. There are always means of bringing him within bounds. The man who, with the machinery now allowed at his command, cannot govern even the wildest spirit has no right to command.

And it is remarkable how few men acting on their own initiative come to grief. The very fact that they are "on their own" makes them keen for the safety of their charge beyond the bounds of common circumspection. They are "safe" then as never before. Don't be afraid. Let them try their schemes. If the machine shop man promises to increase his output by a change in his jig, let him try it and reward him if he succeeds. If the captain raises the efficiency of his command, compliment him, regardless of the means employed. *Beware as you would beware of a slow poison the insidious tendency, born of our discipline and our surroundings, to stifle initiative.* Better a man should fail from time to time in his undertaking than he should settle into the cautious, back-leaning, fearful-of-responsibility, self-safety-seeking bit of inertia our regulations, our disciplinary practices and our very ethics seem to encourage. Such men, though harmless in peace time, must surely fail in the shock of battle from sheer atrophy of self assertion. Such a state of mind is contagious and woe to the service that becomes infected with it.

There is a state of mind peculiarly sensitive to what I may call "*the pain of a new idea*," a real withering pain, so often experienced at the suggestion of something that looks like violence to established routine. Not an imagined pain, a positive physical hurt; transcending every other sensation for the moment in its exquisite torture; paralyzing all reasoning powers, stultifying judgment, arousing fierce antagonism, and rallying all means for defence. Fight against this enemy as you would fight for your life. Keep an open mind. Remember that the novelty of a suggestion need not of itself condemn it. Change? There must always be change. Trouble? We are paid to take care of trouble. "Perpetual peace," wrote Leibnitz, "is a motto suitable only for a graveyard." Granted, if he refers to peace of mind—in a mind so petrified as to abhor change.

The habit of command augments the efficiency of command in the same ratio as it augments one's power of leadership. The older officer frequently succeeds better than the younger not so much because of his added years, his better knowledge or his greater experience, but because he has become accustomed to the exercise of command. He exercises it as if of right. His manner, his voice, his atmosphere carry with it an expectancy of obedience. Many a young man has failed to get response from his men, not through any lack of intelligence, not through any lack of experience, not through any indolence, but through a something in the phrasing or voicing of his commands that carries with it an uncertainty of response or even an expectancy of disobedience. The reserve officer's worth was not furthered so much by the removal of the ring from his sleeve¹ as the ring from his voice, that peculiar ring that enlisted men are ever on the watch for and unerring in their discerning. Young man (and old alike, if I may make so bold as to address you), in your commands, as well as in that other great channel through which the exercise of leadership must flow—discussion—let not a quaver in your voice or a wavering in your logic rob you of the claim your position, your knowledge or your character gives you to influence others; but with faith in the cause you urge, with loyalty to the scheme you further, without arrogance, egotism or incivility, demand of those you would have support you as if that support were already yours.

In any discussion of leadership one is inevitably struck with the intimate relation between leadership and command. Mahan in his "Types of Naval Officers" appears to make a distinction. "Each man," he says, "has his special gift, and to succeed must needs act in accordance with it. There are those who lead and those who drive; Hawke belonged to the one class, Rodney to the other." My belief, however, is that Mahan did not attempt here to delineate leadership from command so much as to exhibit the variety of colors in which leadership may be clothed, and that the use of leader as opposed to driver offered a dramatic expression of the difference between two types of vastly successful leadership. Command, and if necessary, driving, must ever be a salient adjunct to

¹ For a time after being mustered into service the National Naval Volunteer officers wore a circle, or ring, round the corps insignia on the sleeves of their coats to distinguish them from the officers of the Regular Establishment. This was subsequently abolished.

leadership. Command is generally the only means by which a commander-in-chief may express his will or even his wish for responsive activity; it is his mouthpiece, his clarion, his call to arms. And if driving be necessary, driving there must be.

I call to mind an order in a captain's order book. A book, by the way, which was distinguished by its practical nudity as regards orders. There were only two entered during the incumbency of his command. One of these ran as follows:

There has been observed on this ship a notable failure on the part of inferior officers and men to execute with smartness the orders of their superiors. It has apparently become habitual with them to enter into discussion as to the desirability of doing exactly what has been told or to suggest a means other than that which has been prescribed before proceeding to obey.

This slovenliness will not be tolerated. When an officer, clothed with proper authority, gives an order, it is to be presupposed that he knows exactly what ought to be done. It is to be presupposed that he knows better than any person to whom the command is addressed—this because of superior experience or more complete information or other logical cause. The effect of laxity in response or of haggling as to methods is far-reaching in its damage. An officer or man who in ordinary times fails to obey orders with promptness and thoroughness gives cause for serious doubt as to his loyalty in case of emergency.

It is expected that the officers of this ship will not only exact immediate and implicit obedience to their every order, but that they will bear in mind that a good example is far-reaching in its effect.

That order, to my mind, exhibited leadership of the highest type. This captain knew well that his officers knew, or surely soon would know, their business. It was a chant of faith in the machine he had welded or soon would weld. There was not in it so much of dictation, or of "rendering unto Cæsar the things that are Cæsar's," as of the simple demand that must be exacted in every successful undertaking, whether civil or military—that of assured response to authorized direction. No man who fails in this exaction can hope to bring about anything but chaos.

And be not confused. Dictation can never be successfully employed as a substitute for leadership. Men of intelligence resent instinctively a dictatorial attitude on the part of a superior, and many is the time when suggestion will claim inspired loyalty where autocratic command will only result in disinterested obedience. As the oil smoothes the waves so will tact remove the saw edge from intercourse with your inferiors. And know your man. Know

which is the leeward side of the vessel you would board; know which side is approachable of the man you would win.

Tact, however, should not be allowed to become an obsession. Too great a regard for it may rob your every argument of the punch necessary to carry it to enthusiastic acceptance. Absorption in it may cause you to think instinctively of the state of mind of your opponent at the expense of proper presentation of your claim. Abnormal regard for it may rob you of that moral fearlessness without which no man can maintain his leadership indefinitely. For—and it may well be said here—leadership is not satisfied with placid acquiescence. It demands responsive and virile action. It demands partisanship. It demands of one's fellow man that he take off his coat and fight. Fight for the cause if necessary—for the leader whether necessary or not. No man can claim such response unless he himself be morally fearless. Unless he be ready to fight as he would have his followers fight; fight morally or physically as circumstances demand. For there is in leadership an inviolable law of reciprocity. No man can expect loyalty from others unless he carries conviction of his loyalty to them. No man can expect others to fight for him if he does not appear anxious to fight for them. He must be guardian of their rights, anxious for their welfare, concerned for their happiness, rejoicing of their successes, sympathetic of their misfortunes. He must further their interests and convince them by act and deed of the profit to them to be born of loyalty to him. And above all he must fulfil to them his obligations. *No politician ever held his gang who failed habitually to make good his promises.*

The leader must be fearless morally as well as physically. The man who would fail to present a just claim to a superior because the latter is irascible, the man who would fail to listen to a complaint because he fears an argument, the man who would fail to do his utmost to right a condition that has been proved to be wrong and harmful to another on a plea that such restitution will open up a flood of similar claims, is morally a coward; and although he may by compensating traits of character, or by chicanery, maintain his following temporarily, he must in due time fail in his leadership because of the emasculating effect such cowardice or complacency will have upon his character. Young man, be circumspect but be brave. Practice fearlessness—moral as well as physical. Practice it when you are young, to the end that you may

not fail of it when you are old and your country's honor may depend on your possessing it.

Where in our profession, it may be asked, does leadership begin? Where is it first expressed? Where should we expect to find it? Theoretically it may exist everywhere. Wherever two souls are met together there is opportunity for its exercise. It is not necessarily confined to the cabin, the messroom or the quarterdeck. We should, and frequently do, find it forward as well as aft. The man who by his good bright-work influences his coworker to polish better is as truly a leader in his own way as he who guides the course of the fleet. The man who by his happy song augments the amount of coal put on board per hour—he also leads. His influence may not be far reaching, but the luster of his deed is none the less bright. And let not the worth of his leadership be measured by its material scope. In the exercise of his talent he is stimulating it toward perfection. Consciously or unconsciously he is giving it the culture necessary for its growth; he is encouraging its roots to sink deeper into his character, and the deeper they thrust their tendrils the more robust and perfect may we expect the flower of leadership to be when it blooms into widened opportunity. And who can gauge the future opportunity of the man from the fore-castle any more than that of the man from aft? Strange mutations we have seen in the past. Stranger we may see in the future.

For the young officer, whose ultimate advancement to command is more or less assured, the practice of the principles and habit of leadership cannot begin too soon. Youthful days are tropical days, when seed put into the ground spreads, sprouts and brings forth fruit with astonishing rapidity. A bit of self-discipline here, a bit of encouraged frankness there, may bring a reward which in later life may be had only at the expense of vast application. Many are the claims, even when we are young, which the practice of these virtues may exact. Much may be the self denial. But nothing will be demanded beyond the capacity of the young officer who would serve his country well.

In the first place, the young officer must know himself; and know himself to be square. Each to his code and his code should be that of his fathers. He must be clean of body and of mind; for although many are the temptations to attain cheap popularity by unclean routes, many are the pitfalls thereby, and there will always be a sufficiency of the puritan in the men with whom he

must struggle to baffle the attainment of real success by any but clean methods. He should adhere to the disciplinary practices of his forbears. These are based on sound ethics and have stood the test of time; and whereas a man may, by deviations therefrom, sometimes raise his men far above the level of common efficiency, the foundation of his pinnacle is insecure, and invariably he will leave for his successor in command a problem difficult of solution.

Honesty and frankness must be the foundation stone of the young man's character. The habit of straight thought and frank expression is golden. It instils in one the faculty of instinctive right judgment, whereas the man less rigidly schooled may have to search, when time is precious, with dim eyes for guidance. It surrounds one with an atmosphere of trust which inevitably draws men to him.

One of the most distinctive signs of leadership, whether in the young man or the old, is the faculty of eliciting confidences from his followers. It is an elusive art difficult of acquisition, varying aberrantly with the type of one's associates and ever ready to vanish without apparent reason. But it is invaluable to the leader who holds it. The superior who inspires his subordinates to speak out ever with frankness, who never upbraids them for faulty opinion, who never ridicules them, who encourages their personal confidences, has a grasp on his men that is difficult to shake. If a man is your guest, induce him to talk. *No man has enjoyed your company who hasn't talked considerably himself—and about himself.*

"One of the greatest difficulties I have," said a captain to me once, "is to get out of my officers the plain unvarnished truth. It is not that they are consciously mendacious, but they frequently instinctively secrete from me as much information as possible, as if knowledge of it might in some obscure way place them in a bad light. This attitude may come from the correctional atmosphere they encounter upon their entry into the service when they are in the most impressionable and sensitive period of their lives. It may come from the system of punishment and reward they encounter later on. Be that as it may, I am frequently encountered by an absence of frankness that is baffling."

Unfortunately, this condition is frequently encountered. Most of us have upon occasion failed of right decision because some coworker has held back from us information which should, in frankness, have been ours. And this with no sinister intention

but because of instilled force of habit. Habit of telling nothing more than the law demands. More frequently, however, the fault lies on the other hand. Many a senior (and how many would be shocked if apprised of the fact!) is regarded by his subordinates as unapproachable. Many are held in abject fear.

That this characteristic, whether wilfully or unconsciously assumed, is inimical to the interests of leadership is needless of iteration. The man who instinctively feels that communications are unwelcome, hesitates, as a rule, to make uninvited ones. The man who feels he is habitually greeted with lack of consideration may have his worth to his master counted as at an end. "Friendship becomes impossible and even co-operation difficult." And no man can exercise leadership to its fullest possibility without both co-operation and friendship on the part of his associates.

Mahan analyzes with ample clearness an example of disaster rightfully consequent to a lack of this combination. He writes: "Douglas (Rodney's chief of staff) was of the same opinion as Hood, and for making the suggestion at the proper moment had been snubbed by Rodney, who had established over him a dominion of manner which precluded proper insistence, or even representation, such as became his office." Such a condition is dangerously easy to come into being in our present-day practice. A strong man in his very earnestness is an easy prey to inconsideration or even villification of his associates. Needless to say, such lapses are not only invariably discreditable but are equally unprofitable. The division officer who leaves the executive feeling that he has been abused may as well be counted out so far as that day's work is concerned. Even if he try his best he will, in all probability, fail of success. The captain who leaves the flagship feeling that the admiral has snubbed him goes, in nine times out of ten, a disloyal servant. Many a man has felt his finest ambition die cold within him because his suggestion, recommendation or request has been ruthlessly rejected.

Nothing but resentment can spring from inconsiderate treatment; and a person filled with resentment, regardless of his station or character, is a sometime laggard, and not without justification. "I shall never make another suggestion" is a remark frequently heard in cabin and messroom alike. Doubtless it is also heard in some form or other at the wooden mess tables forward. With that feeling abroad what hope can there be for successful leadership on

the part of the man responsible for it? Unquestioned obedience to orders is one thing. Disposition to suggest another, and not necessarily inimical to the former. No man has so firm a grasp on his business as to warrant deafness to the opinions of his subordinates. No man on earth has attained complete understanding. Not only may something frequently be gleaned from the most unworthy of his helpers but the mere fact of listening to him draws the subordinate to him with a bond unequalled in its strength by any other artfulness. Acceptance of his view may make him your slave forever. *Proud is the man whose counsel has been taken by his elders.*

Above all things the leader must know his profession. Organize well, shoot well, sail your boat well, handle your ship well. Be exact in your knowledge and practice. If you would explain a cannon, know its details. Many a man has been told there were 22 grooves in a bore when he knew there were 24 and has therefore regarded his preceptor forever after as a false alarm. If you teach a man to stand at attention you should know the angle his feet should be apart; how far his shoulder from his next file; how far the rear rank stands behind him; what he does with his hands; where his chin should be. If you wish the company to go "squads right" don't command "squads left." When you inspect your men's bright-work, see that it is clean to the edge and that the cleaning paste is not smeared over adjoining wood. If your man paints the waterway see that the square mark is kept distinct; when he sets his sight see that the markings are in exact conjunction; when he lays the gun exact a crossing of the wires in the center of the bull. All this, not merely for the success of the day's work, but for the good of your soul. Be meticulous in your own work and demand exactitude eventually from others. In no case, however, should you permit absorption in detail to cloud your vision of the end in view. Remember that in gunnery's vast and complex ramification, there is an axiom which envelops the whole study: *Hit first, hit furthest, hit fastest.*

Remember that your duty does not end with the day's work nor is your calling bounded by the bulwarks of the ship whose deck you tread. Look abroad—look ahead, to the end that when opportunity, so fickle in her favor, flirts with you, she may not find you a backward lover, or an unpolished courtier. Put your "touch" into your every undertaking. Be not satisfied that your work is

done, but see that it is handsomely done. As a young man see that snap goes into your drill. As a captain handle your ship with boldness. As an admiral lay your fleet across the other's course. The lieutenant who brings his company to a "halt" with snap and vigor, will probably command as a captain an efficient ship, as an admiral a smart—and if the chance offer—a victorious fleet.

It is not necessary—it is not even desirable—that an officer should correct every infraction in others or that disciplinary measures should be imposed for every shortcoming. Seagoing has never been an exact science, and sea temper never one to endure carping criticism. Many a ship has just missed efficiency because the captain, to use the phrase of an old boatswain of my acquaintance, had a habit of "coming on deck and raising hell with the ship." On the contrary, many a captain has raised his ship "to the heights" through knowing when to compliment and when to support. Many a one has become a lasting hero to his tribe by the signal "The captain was on the bridge and is responsible."

On the relations between officers and men the written word is voluminous; the precept ever present. Why reiterate? Perhaps the subject is best summed up in the admonition of the late Theodore Roosevelt: "Guarantee to every man his full rights and exact from every man the full performance of his duty."

And finally conform to the forms and practices of gentlemen. It is true that every man regardless of his birth, stature or education loves to fondle the belief that he has within him the rugged qualities of the cave man. More, he may be induced if occasion appear opportune to parade his enchantment audibly before you. He may whisper it in modesty, he may cry it aloud in impudence, but the image itself will be unmistakable. In primordial vanity he will revert to the ethics of his forbears. He will picture himself as capable—aye, even desirous—of *clubbing* something into submission and maintaining his sovereignty over it *with the club*. He will especially fancy the simplicity of such a procedure and will regard with abhorrence the more complex practice demanded by effete society. And this is well. The spirit of dominion is vital to success in any undertaking. It is an inherent adjunct to the character of any man who in his heart is determined to win. The mastery in point may be mastery over other men. It *must* be a mastery over every obstacle—man, object or beast. Naturally then all red-blooded men view with misgiving

any indication in manner, action or speech savoring of weakness.

But it is equally true that it is most generally in ignorance we find the association of gentlemanly conduct with effeminency. Significantly true that the deeper the ignorance, the more acute will be the suspicion. It is only in the slums that we find the spirit of boorishness glorified. Gentlemanly practice, in its truest sense, is invariably associated with completeness of education, and every lapse therefrom attributed to ignorance. John Paul Jones must have had in mind the limitations of educational opportunity prevalent in his time when he wrote: "None other than a gentleman as well as a seaman, both in theory and practice, is qualified to support the character of a commissioned officer in the navy." And his "theory and practice," be it understood, qualified both his requirements, not solely the latter. However that may be, his admonition applies strikingly to the present. With our latter-day education and our accepted system of character building, there should be no lapse from this "theory and practice" on the part of any officer of the navy. One who is negligent of his obligations, unpolished in his manners, untutored in his presentment, vulgar in his speech, or sloven in his attire is unfit to lead and never will attain leadership unless it be of a mob. The forms and exactions of society will be invariably found to have sound reason for their exaction. The fact that they have stood the test of time guarantees their rationality. Hardy is the man who would abandon them for a product of his own imagination.

And let the deed support the thought. Be champion of the right, defender of the oppressed, supporter of the weak. Be courteous to your elders, deferential to your superiors, respectful to your betters. Let not the spirit of *noblesse oblige* perish from the face of the earth.

And by these tenets may leadership be acquired. Not by one, but by all of us. We may not all attain the same pinnacle of excellence, but each according to his several capacity. We should not be discouraged if the thing we seek seems ever to evade our grasp. Remember our moment may not yet have come. Opportunity may not yet have knocked at our door. And knowing in our inner conscience that we have done our best, knowing that we have given all that is in us to give, knowing that we have served our ideals unswervingly, we may know that we cannot entirely have failed.

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THE STRATEGY OF THE WORLD WAR, AND THE
LESSONS OF THE EFFORT OF THE
UNITED STATES

By CAPTAIN THOMAS G. FROTHINGHAM, U. S. R.

In the great mass of literature that has sprung up in the track of the World War, the writer has not seen any attempt to state its strategic problems in the simplest terms. It is always helpful to reduce any problem to its essential factors—and to-day the unusual condition exists that this may be done, in the case of the World War, much sooner than has been possible in studying any other war. In spite of the vastness of the struggle, never before has so much been known of a war even while it was being fought. By this is meant that there has been actual official information available, excluding the misleading writings of correspondents and critics. It is also a fact that never before have so many of the principal leaders in a war given their stories so promptly.

With these great advantages, there is no reason why we should hold off from the study of the strategy of this war on account of the large scale of its operations. The events which really counted moved with the simplicity and directness of Greek tragedy. We should realize this—and, in our amazement at the enormous volume of men and material evoked by the world's holocaust, we must not be blind, to the fact that these great forces were subject to the unchanging fundamental laws of warfare. There is really nothing in the immensity of the contest that should disarm criticism, especially in view of the human fallibility shown in the conduct of this war. In fact the World War was one of blunders and unsound strategy, to a greater extent than most wars of the past.

The supposedly infallible German Superman was not long in showing ordinary human lack of understanding the initial strategic problem of Germany, and this soon neutralized the results of long

years of German preparation. For Germany, at the outset, there existed an advantageous strategic situation, that was thought to be a sure promise of victory. The Teutonic Allies possessed a central and concentrated position against separated antagonists. This was the result of events in preceding years, as Russia had been shut off from Great Britain and France.

With this established condition, that their enemies would be separated, the Germans were enabled to plan to attack the Entente Allies in detail—first France, then Russia. This was the strategy of the German General Staff, and it was to be carried out by the Schlieffen plan of war “on two fronts.”¹ This plan had been determined years in advance, and it had been elaborated with rigidly fixed details, to the exclusion of all other solutions. Its strategy obsessed the Germans. It was the product of the hierarchy of Clausewitz, Moltke, and Schlieffen—and that it would fail was thought impossible.

Of this German plan of war, it should be stated at once that it violated a fundamental of warfare, in that it was essentially a military plan and neglected to make full use of the navy arm. Admiral Tirpitz unqualifiedly says that the navy’s plan of operations “had not been arranged in advance with the army.” For the Germans to allow themselves to be absorbed in this military plan was an error.

It is true preponderance in sea power rested with the Entente Allies, but Germany had made great efforts to develop a navy. The German fleet possessed the advantages of the double base at Kiel and the outpost of Heligoland. The Germans had also made great advances in the use of mines and submarines, the weapons of a weaker fleet. In addition, there was another argument for naval activity in coöperation with their armies. Outside of the recognized value of additional threats as diversions at the time of an intended offensive, there was a state of mind in Great Britain which would have favored the success of German naval threats. It is known that belief in a German plan to invade England was prevalent among high British officials, and this would have helped a German naval diversion. In this respect, at the outset, the German High Command failed to use all the strategic means possessed by the Central Powers. As a matter of fact, the Ger-

¹ Bethmann-Hollweg.

man naval forces merely made scattered forays of no importance, and at the outbreak of war German strategy must be studied as restricted to the Schlieffen military plan—to overwhelm France by “forcing a speedy decision,”² while Russia was to be contained.

Yet it must be admitted that, if the German purely military solution had proved to be correct, there would have been grave danger of a defeat that would have paralyzed France and lost the war before the sea power of the Entente Allies could have exerted its effect.

To appreciate this danger it is necessary to realize that, at the declaration of war, as a result of the preparations of Germany, a military situation actually existed which enabled the Central Powers to call into being a superior military force at the outset. On the other hand, time was required by the Entente Allies to produce an equal force and to make use of sea power.

Consequently the logical strategic aim for Germany should have been to impose this superior military force at once with destructive effect upon the Allied armies. This long-prepared Teutonic military superiority would only be able to gain its necessary quick victory, if brought into immediate crushing contact with the less prepared armies of the Allies. It is an axiom that the stronger force should seek contact at once with a weaker enemy, and not allow the weaker enemy time to gather strength. Immediate contact with the French armies should have been the essential of German strategy.

The Schlieffen plan of war had been devised before 1906, in the days when it was held that against France “a frontal attack offered no hopes of success”³ on account of the high value assigned to the French frontier fortresses as strong points in the positions of armies. To avoid a frontal attack Schlieffen planned the encircling sweep through Belgium. In 1914 the Germans actually possessed new artillery which neutralized fortresses as strong points, but the German strategy had become so tied to this

² Falkenhayn.

³ Stein, the German War Minister of 1916–1918, who reiterates the reasoning of the German Staff, in his book, holding that the Belgian invasion was necessary on account of the strength of the French frontier fortresses. “The strength of fortresses was utterly exaggerated because the power of hostile artillery was underestimated.” Bernhardt, *The War of the Future*.

fixed plan that there was no thought of change, and it was carried out in every detail.

This elaborate encircling movement through Belgium, to which the German General Staff had thus committed the powerful German armies, failed to produce the essential result of imposing these German armies in destructive contact upon the Allied armies, until after the Allies had gathered sufficient force to fight an equal battle—and, in the words of Falkenhayn, “the intention of forcing a speedy decision, which had hitherto been the foundation of the German plan of campaign, had failed.”

It should also be stated that, although the German armies were mobilized with wonderful efficiency, the German Headquarters made a poor showing in handling these armies in their scheduled operations. Owing to the lack of army group control the two encircling armies of Kluck and Bülow were at odds a great deal of the time.

On the Eastern front the German General Staff had overconfidently assumed that Russia would be slow in mobilizing and would be contained without much difficulty. Instead of this, East Prussia and Galicia had been invaded, and, although Hindenburg and Ludendorff had decisively defeated the invasion of East Prussia, the Eastern front had already become a drain upon the resources of the Central Powers.

Consequently the middle of September, 1914, saw the failure of German strategy to win decisive results with the great forces that had been prepared through so many years. The Moltke régime was ended, though this fact was kept secret to prevent “further ostensible proof of the completeness of the victory obtained on the Marne.”⁴ Then and there the decision was forced that the World War was not to be a quick overwhelming victory won by Germany’s long-prepared military strength. Not only had the perfected strategy of the Schlieffen school failed to win the victory which had been thought certain, but also great harm had been done to the prospects of Germany by the moral effect of the invasion of Belgium. Moral forces are of actual strategic value in war—and there is no question of the fact that the violation of Belgium⁵ arrayed strong moral forces against Germany.

⁴ Falkenhayn.

⁵ “Our greatest disaster: the German entry into Belgium,” Count Czernin, In the World War.

By this defeat of the German war plan of 1914 a complete change had been brought about in the strategic situation. The Central Powers had lost the offensive. Not only had their armies been brought to a stand-still, but the Teutons were ringed about by their enemies, and from this time on they were destined to feel the relentless pressure of sea power in the hands of the Allies. At this stage the Central Powers were practically besieged, being even shut off from their new ally, Turkey. This situation per force created its new strategic objectives. That of the Allies was to constrict and press the siege. That of the Central Powers was to break through and raise the siege.

These objectives could hardly fail to be the visible motives of the strategy of 1915. The advantage lay with the Allies, and on the surface their plans were promising—the attack upon the Dardanelles, followed by prepared offensives in the West and in the East, with the entrance of Italy against Austria. It was in their estimate of the means necessary to carry out their strategy that the Allies failed utterly. In the Dardanelles attack ships' guns were expected to equal the effect of the siege howitzers, and the other offensives of the Allies so entirely lacked any conception of the forces necessary, that they became mere ineffectual nibbles that did not even divert the Teutons from their objectives.

On the other hand, it must be admitted that, in contrast with 1914, the new régime in the German General Staff showed an adequate conception of its necessary strategy. Yielding to the Hindenburg-Ludendorff influence, it was planned merely to hold on the West but to break through by main strength of artillery in the East, a great advance over the artificial strategy of 1914. In 1915 the German strategy was complete both in preparation and in the tactics employed. The break-through was accomplished with losses for the Russians that crippled their armies beyond repair, and it also resulted in the accession of the Bulgarians and the overthrow of Serbia. These victories were won without a possibility of a diversion, in consequence of the feeble preparations of the Entente Allies. The siege of the Central Powers was raised, and the Mittel Europa tract was won by the Teutons.

Only on the seas had the Entente Allies won results in 1915. The German fleet had remained a menace that necessitated a great force to contain it; the Germans controlled the Baltic and the Dardanelles—and in 1915 were making tentative efforts to develop

a submarine offensive. But in the main the Allies controlled the seas, reaped the advantages of free use of the water-ways, and excluded the Central Powers from use of the seas—thus keeping up a pressure upon the Teutonic Allies that increased as time went on.

At the beginning of 1916 there was a great strategic opportunity for the Central Powers. Russia had been crippled to such an extent that evidently it was out of the question for the Russians to undertake an offensive in the early part of the year. The measure of the other Allies had been taken in their weak efforts of 1915, and consequently it was also certain that no offensive was to be feared by the Germans early in 1916 in other theatres. The Central Allies were thus enabled to take the offensive and to concentrate troops at chosen points of attack, without running the risk of counter strokes.

It was decided that the Germans would attack at Verdun and the Austrians would undertake an offensive against the Italians. These offensives were both sound operations in every strategic sense to undertake at this time, with conditions in favor of their success as stated—and with decisive results sure to follow, if carried out by proper means.

Yet with all this advantage for the Teutons in military conditions established at the beginning of 1916, the Central Powers failed to adopt sufficient means to carry out their strategy.

The German assault upon the Verdun sector of the Western front was planned to duplicate the successful break-through by concentration of heavy artillery against the Russians in 1915. As Falkenhayn states, it aimed to impose the German force at a place where the French must stand and fight. The concentration of artillery and troops was successfully made, with the element of surprise attained—and the immediate success of the initial attack showed the soundness of the plan, if it had been made upon a broader scale. As it was, in their confidence in the German artillery tactics for breaking through, the Germans carried out their operation on so narrow a sector that their offensive was smothered. The small margin by which it failed, even with this defect, is comment upon the danger if anything approaching the German tactics of 1918 had been adopted.

The Austrian offensive of 1916 against the Italians had also won a measure of success, but the fatal error had been made of

over-confidently weakening the southeastern front opposing the Russian armies.⁶ The Russians were thus enabled to take the offensive in June, and win sufficient success against the weakened Austrian lines to compel the Germans and Austrians to send reinforcements to that front. This necessary diversion of troops made it impossible to go on with the offensive against the Italians.

The Central Powers had thus lost the offensive on both fronts, and at the middle of the year 1916 there was a complete change in the military situation. As a result, in the last half of 1916, the Entente Allies were enabled to undertake three ambitious offensives, the Battle of the Somme, the Russian attacks in the south-east, and the Italian Gorizia offensive. From all of these great things were expected, but none fulfilled the hopes of the new optimism then prevalent among the Allies.

Of these offensives the Battle of the Somme was made possible because the British armies raised by conscription were at last ready for action on the first of July. On that day began the series of joint operations by the British and French, with the British taking the major part, which lasted into November. The Battle of the Somme was a determined effort to dislocate the German armies, but tactics had not been devised that would bring to bear forces strong enough to win that result, and the operation degenerated into the so-called tactics of "limited objectives," with heavy losses for the British.

The power of the Russian offensive had been much overestimated, and the Russian armies were checked all along the line by early fall. The same fate befell the Italians in their offensive. After capturing Gorizia without much trouble, the Italian armies were again brought to a standstill in the difficult mountainous country.

Rumania had also made her ill-timed entry, having delayed until after the Russians had been rendered incapable of rendering assistance. Consequently the new Hindenburg-Ludendorff régime, which had been given control of the Austro-German armies, had no difficulty in overrunning Rumania, while at the same time the Somme offensive was worn down, and the Italians and Russians checked from any operations that might have created a diversion—

⁶ "... under the impression that the successful repulse of the Russian winter offensive had made Austria-Hungary safe." Ludendorff.

an example of the strategic value of central position and united control.

On the sea in 1916 the Entente Allies were exerting increasing pressure upon the Central Powers. The great indecisive naval action of Jutland had brought no change in the actual situation. Germany had attempted an illegal campaign with her submarines, but this had been dropped upon the demand of the United States. At the end of 1916, urged on by those who held that unrestricted submarine warfare would win the war, and convinced of the truth of their calculations, the German High Command adopted the fateful plan of war of 1917—to hold their conquests with their armies, but to make their offensive an illegal campaign of unrestricted submarine warfare.⁷

From this date Germany made herself an outlaw among nations—and again the German High Command had deliberately chosen strategy that aligned strong moral forces against the nation. The German leaders had founded their strategy of 1917 upon the calculation that they would win before outraged America could change the result.⁸ They thought they could win by these foul means—and the result of their decision was upon their own heads.

The campaign of unrestricted submarine warfare proved successful to a degree that upset existing conditions. It came very near destroying the Allied control of the seas and winning the war,⁹ but it also accomplished the most harmful strategic result of all against Germany, as it brought the United States into the war—a factor that turned the balance to defeat for the Central Powers.

On the other hand, at the beginning of 1917, the Allies' conception of their strategy was utterly at variance with the imposed existing conditions. At last the Entente had advanced to the

⁷ ". . . on December 23 the Field Marshal expressed to the Chancellor his view that the adoption of unrestricted submarine warfare was essential." Ludendorff's Own Story.

⁸ "The blockade must succeed within a limited number of weeks, within which America cannot effectively participate in the operations." Bethmann-Hollweg, 1917.

⁹ "It is impossible for us to go on with the war if losses like this continue." Admiral Jellicoe to Admiral Simms, *The Victory at Sea, The World's Work*.

stage of a plan for concerted military operations on all fronts.¹⁰ Yet the actual situation was that Russia had been so broken, in bearing the main burden of the war for two years, that the nation was on the point of revolution and was no longer of any value as a military factor. As a result, in the spring of 1917, the strategy of the Entente Allies, with Russia paralyzed by Revolution had dwindled into attacks upon the Western front, made more difficult by the rectification of the German lines by the Hindenburg-Ludendorff control.

Fortunately the completeness of the military collapse of worn out Russia had not been appreciated by either side. For this reason, the gradual development of Russian helplessness was less of a shock to the morale of the Allies, and the Central Powers were slow in realizing that they might safely withdraw large numbers of troops from the Russian front. In fact the last strategic service of the Russian armies was thus rendered by the empty threat of their former power, and the delay made the concentration against the Italians so late in the year that it helped to save the Italian armies from utter destruction in the disaster of Caporetto. But the year 1917 ended with the Italian armies so shattered that to repair them had become a drain upon Great Britain and France, at a time when the British and French armies had been woefully depleted by the losses of the unsuccessful battles of 1917 on the Western front.

It was true that the Central Powers had failed to win their expected decision through unrestricted submarine warfare, but the beginning of 1918 found them enabled to concentrate the full German strength upon the Western front, without any danger of a diversion elsewhere. This ability to move troops from the East gave the Germans an actual superiority in numbers,¹¹ as the British and French resources in man-power had been drained in the costly and unsuccessful battles of 1917, to such an extent that it had become a hard task to fill the ranks of the British and French

¹⁰ " . . . a series of offensives on all fronts, so timed as to assist each other by depriving the enemy of weakening any one of his fronts in order to reinforce another." Sir Douglas Haig's Despatches. See also Lloyd George quoted in the author's *A Guide to the Military History of the World War*, p. 176.

¹¹ "Numerically we had never been so strong in comparison with our enemies." Ludendorff.

armies. There was no hope of an increase to offset the German reinforcements from the East.¹²

Possessing this assured superiority,¹³ the Germans were able to plan their offensive of 1918 without any danger of counter attacks. Ludendorff had become the controlling power in the German General Staff. His strategy was a return to the direct methods of concentration of forces against a chosen point of attack, and new tactics had been devised by which many divisions were grouped against the chosen point, insuring successive streams of troops which infiltrated the enemy positions and dislocated the defenders.

These new tactics were surprisingly effective against the Allies, and at the beginning of July, 1918, this formidable German offensive, in a series of overwhelming attacks, had so smashed and dislocated the Allied armies, even after they had at last been united under the command of Foch, that it is difficult to see how the situation could have been saved except by a strong reinforcement for the Allies—and this could only be furnished by the American troops.

To define this critical military situation explicitly, it is only necessary to quote the following statement of the Versailles Conference, June 12, 1918:

"General Foch has presented to us a statement of the utmost gravity . . . as there is no possibility of the British and French increasing the numbers of their divisions . . . there is a great danger of the war being lost unless the numerical inferiority of the Allies can be remedied as rapidly as possible by the advent of American troops . . . We are satisfied that General Foch . . . is not overestimating the needs of the case . . ."

D. LLOYD GEORGE.
CLEMENCEAU.
ORLANDO.

The United States Army was able to provide the necessary reinforcement that turned the balance,¹⁴ with the result that the

¹² "Allied resources in man-power at home were low and there was little prospect of increasing their armed strength." Gen. Pershing.

¹³ "Where on March 21, 1918, the German army on the Western front began its series of offensives, it was by far the most formidable force the world has ever seen." General Pershing.

¹⁴ "These hordes of American troops on the continent which turned the balance against us on the Western front in 1918." Tirpitz.

offensive always remained against the Germans, and they lost the war.

There is no longer any question of the fact that the German Headquarters made their calculation that it was utterly out of the question for the United States to exert any physical force upon the war.¹⁵ The German leaders had on occasions yielded to keep us out of the war, to avoid having our resources at the service of the Allies, but the Germans applied their own formulas to our nation, and, following these, it was held a military impossibility for an adequate American army to appear upon the fighting front. It must also be said that this was the prevailing opinion among European military experts of all countries¹⁶—and from the European point of view a military impossibility was accomplished when our troops performed their part in the war.

Our strategic problem was an operation against a contained enemy—with the great advantage for us of freedom from danger of being attacked. But it was complicated by the condition that transportation overseas, which would normally have been provided by Allied shipping, had been impaired by the submarines to so great an extent that we were compelled to provide a large share of the transportation ourselves. The submarine menace, and its diversion of Allied naval forces, also made it imperative for us to provide a great proportion of the necessary naval protection. There was the added urgent necessity of haste—or the war would be lost.¹⁷

This crisis demanded an effort on the part of the United States that would comprise: raising and training an army; transporting a great part of that army overseas; providing supplies and transporting them overseas; giving naval protection; providing terminals and bases overseas to receive and handle the troops and supplies. All this must be done in haste, and at the outset on the

¹⁵ "Would she appear in time to snatch the victor's laurels from our brows? That, and that only, was the decisive question! I believed I could answer it in the negative." Hindenburg.

¹⁶ "Joffre in an interview with the Secretary of War in May, 1917, said that 400,000 would be our limit, and that one French port would be sufficient to receive them." Admiral Gleaves, *History of the Cruiser and Transport Force*.

¹⁷ "The Allies are very weak and we must come to their aid in this year, 1918. The year after may be too late." Gen. Pershing, 1917.

large scale set by the unprecedented demands of the World War. There was no time for the gradual development of forces, as in the case of other nations.

No nation in history ever faced such a task, and all this was accomplished by the surge of our people,¹⁸ united in belief in our unselfish duty in the war—a force moral as well as physical that brought about cleavage between the German Government and the German people,¹⁹ which became a strong factor in breaking down the German militaristic structure. Our moral force²⁰ sowed the seeds of German revolt against the German Government—and America's unexpected physical strength for war turned German victory into German defeat.²¹

In tracing the course of the war, the failure is self-evident of the most perfected military machine in all history—and the continued inability of the Allies to progress beyond piece meal methods is equally apparent. The wonder of the war has been the fact that the peaceful United States proved to be the one nation that coördinated the functions of its military, naval, and industrial forces, to accomplish its full strategic objective, in the time set by a crisis and on the enormous scale demanded by the World War.

To study the causes that brought about this result will become the most interesting thing in connection with the war. Our effort will be recognized as one of the great uprisings, which have shown the world that human forces united by some powerful fusing impulse are stronger than artificial military conditions. To find a comparison, with the exception of our Civil War, it will be necessary to go to the great movements of the northern races which overran Europe. France, after the Revolution, has always been considered unique as an example of a united uprising of humanity finding in Napoleon an ideal leader. Yet, with all the years of enthusiasm for the Emperor, it was only the military and industrial forces that reached full strength—Napoleon was never able to vitalize the naval arm.

¹⁸ "Her coming was like an avalanche. The world has never seen anything like it." Lloyd George.

¹⁹ "By working upon our democratic sentiments the enemy propaganda succeeded in bringing our government into discredit in Germany." Ludendorff.

²⁰ "For American soldiers the war became as it were a crusade against us." Ludendorff.

²¹ "America thus became the decisive power in the war." Ludendorff.

It should be bluntly stated that, in every military sense, we were unprepared—and this retarded everything at the start. For a time it looked as if European prophesies as to our helplessness in war would prove true. Then, from delays and confusion emerged the miracle, the army and navy forces of the United States. It is true that all kinds of mistakes were made, but behind our operation was a strong impelling force that had not been measured since the Civil War.

As has been said, the Civil War is the only basis for comparison. In that war our nation had shown that Americans, when aroused by an appeal, instinctively developed strategy, tactics, and weapons far in advance of their time. Students of the Civil War believed that the qualities shown in that epoch-making war were still innate in our people, but European experts had never appreciated the lessons of 1865 until the World War had confirmed them—and there was even doubt in America as to whether the same fibre remained in our nation augmented by immigration.

But, at the great summons, it was shown that the same spirit was vital in America. We had even advanced, as a result of the American habit of mind in thinking in terms of great masses in all our industries. This made it instinctive for Americans to solve our war problems by means of the same methods, of assembling the great plants first and then their products, in men and in material, on a large scale. These American methods insured the success of our effort on land and sea.

The striking attribute of the Civil War soldier or sailor, the game-playing ability to handle himself and his utensils, was again present. With our freedom from the dulling effect of class distinctions, there was intelligence in all ranks, and a better coördination, with, above all things, the adaptability of the Americans to receive instruction from infusion of trained personnel.

In fact one great outstanding lesson of the World War was the demonstrated fact that it was possible to vitalize a new American personnel in the Army and Navy by the infusion of a comparatively small number of trained men, and in an incredibly short time the whole personnel would be "leavened," as Grant expressed it. It is no exaggeration to state that, given a selective draft of the American intelligent and adaptable personnel, it was proved possible in the U. S. Army and in the U. S. Navy for every nucleus from a trained force to produce a unit of practically equal value.

The effect of this goes far beyond any formerly accepted basis for estimating our defensive strength. The conclusion is logically suggested that the United States has a resource which, rightly used, would enable our country to be the first to produce forces on the vast scale demanded by warfare of to-day. This is speaking in terms of the present, when the establishments of Europe have been scattered. At once a greatly increased value is shown for our Army and Navy in this enlarged function of infusion of skilled elements into a new personnel.

Taking the only broad view of this developed function of the U. S. Army and U. S. Navy, it is evident that there are two fixed conditions in the problem of the United States. On the one hand, in view of the lessons of the war, an army and navy *in being* of anywhere near modern war-strength cannot be maintained by any nation on earth. On the other hand, the United States has shown that it has the quickest turnover of man-power in the world, especially adapted to receive training through contact with an infusion of skilled officers and men. This at once gives a double value to our Army and Navy in being, not only as trained forces in themselves, but as leaven for the great mass of citizen recruits. In no other nation is it possible for the permanent establishment to have this second value. Consequently the United States has the best argument for maintaining its Army and Navy.

This new value should be recognized as an asset for our nation, of which the test has been made in war. Especially should we realize its existence at the present time, when we are at the stage of fault finding and recrimination, with every mistake being magnified and every personal grudge expressed. Added to all this, is the natural reaction and loss of interest in army and navy affairs. This is only a temporary apathy, but there is danger of the Army and Navy again becoming separated from our people.

Before the World War the services and the people were strangers. Our citizens did not understand the Army and the Navy, and both services underestimated the capacity of our people for warfare. The World War has brought every family in the country in touch either with the Army or with the Navy, and it has been proved that in this close relationship lies our strength. It is important that this touch should be maintained, not as a task imposed upon our citizens, but with the recognition of mutual interest and ultimate service together. This is the doctrine taught by the war.

It is consequently most important that every means should be employed to maintain close relations between our Army and Navy and the American people. A working basis has been established for this in the new Army policies of localized units and vocational training. By these provisions the soldier is identified with some definite community, and the young man in the army is being made valuable to his community in civil life, even while he is drawing army pay. In the Navy good results in the same line are to be expected from the new service for Reserves and from the close relationship with the enlarged Merchant Marine.

The R. O. T. C. courses are very practical means of keeping our young men in touch with the services, and every young man who takes such a course not only has the benefit of the training himself, but he takes a knowledge of the service home with him, and thus becomes a link between the services and the community. For this reason every form of voluntary study should be encouraged—and camps and practice cruises provided.

The National Guard is another element of great value, and as great a number as possible of Reserves should be maintained. Both factors are important links between our people and the services, and the friendliest relations should be established for mutual understanding.

With the recognition that the defense of our country means welding our people, our Army, and our Navy into one whole, the United States has the highest and truest reasons of all the nations on earth for maintaining an army and a navy. We accomplished our task in the World War because our Army, our Navy, and our industries all worked together, impelled by the great fusing force of our national uprising. We should never again look upon them as separate factors—and we never should forget the source of our strength. The lesson we have learned should be the foundation of our doctrine, never to be obscured by other interests.

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THE PLACE OF NAVAL OFFICERS IN INTERNATIONAL AFFAIRS

By LIEUT. COMMANDER G. B. VROOM, U. S. Navy

From the establishment of the United States of America as a sovereign power to the present day, naval officers have played parts of the utmost importance in international affairs. England from the days of the Tudor Navy, especially in the Mediterranean and in the Far East, has been ably represented by her seamen. The rise of England's power on the ocean, is due no less to her defeat of the Spanish Armada, and the subsequent maritime activity that followed that epoch-marking event, than to the efforts of her naval commanders in the realm of diplomacy. Naval officers first recognized the importance of the Mediterranean to England's greatness; the foundations of her power in those waters were laid in the times of the Commonwealth and the restoration in spite of the greatest difficulties encountered both at home and abroad. The achievements of Lord Nelson, diplomatic as well as warlike, closed a period of almost two centuries in which England's greatest men appear, leading her on to empire and to the absolute command of the sea.

The Century Dictionary defines diplomacy as: 1. The science of the forms, ceremonies and methods to be observed in conducting the actual intercourse of one state with another, through authorized agents, on the basis of international law; the art of conducting such intercourse, as in negotiating and drafting treaties; representing the interests of a state or of its subjects at a foreign court, etc. 2. The art or practice of negotiation or official intercourse, as between independent powers; diplomatic procedure in general; the transaction of international business. Hence, 3. Dexterity or skill in managing negotiations of any kind; artful management with the view of securing advantages; diplomatic tact.

The greatest natural gift necessary for the successful prosecution of public affairs may be summed up in what is known in the Far East as "face-pidgin." This may be said to include a knowledge of the fitness of things; courtesy, dignity, a willingness to respect the customs and prejudices of the person with whom one is dealing; the instinctive knowledge of how to do the proper thing at the proper time. The nearest English word is tact; but "tact" does not quite cover the meaning.

The essence of the naval profession is the ability to judge men. In addition, there is required of every successful naval officer personal magnetism and leadership.

A recognized aptitude for public affairs, a thorough knowledge of the forms of procedure and methods of international intercourse, would naturally be required of any man appointed to a diplomatic post or to a responsible command at sea, on a foreign station.

Add to these judgment, firmness and decision, and we have the qualifications necessary to a successful diplomat or naval commander; all of which were possessed in the greatest degree by the brilliant men of the past.

In the modern world, with the ease and rapidity of communication, the spheres of independent action of diplomatic representatives as well as naval commanders, have narrowed tremendously. This is more especially true as regards the routine despatch of business between friendly powers through their respective foreign offices and the various diplomatic agents accredited to them. Rare indeed would be the occasion, in these days, when the question of peace and war, the negotiation of a treaty, or even the settlement of a comparatively minor question, would depend upon the initiative and decision of a diplomat or naval officer, without reference to his government. It may be said that ordinarily a diplomat is merely the mouth-piece of his government, with the additional duty of collecting and transmitting such information concerning the government to which he is accredited, as he might think of value. His usefulness would therefore depend almost entirely upon the ability to make friends, through or from whom he might acquire information.

There are occasions, however, when upon him would devolve vast responsibility, as in the old days. The question of war might depend upon the firmness with which he dealt with delicate ques-

tions; his attitude might be interpreted as the attitude of his government. No less are the possibilities that might befall a naval commander to-day, especially in Latin America, and the Far East, where communication is more uncertain, and where events are apt to move more swiftly.

History is replete with the names of men of genius in the military and naval professions, who were no less skilled as diplomatists. To go no farther back than the latter years of the eighteenth century, we find Nelson, at that time a rear admiral of the blue, given diplomatic powers that would under no circumstances be accorded to-day; powers that left to his sole discretion what amounted to a declaration of war upon neutral states. These powers were delegated by the commander-in-chief on the station whose orders from the Lords Commissioners of the Admiralty were to appoint "a discreet officer" to carry out their plans.

In pursuance of instructions I have received from the Lords Commissioners of the Admiralty, to employ a squadron of His Majesty's ships within the Mediterranean, under the command of a discreet officer. . . . I do hereby authorize you, on being joined by the *Culloden*, etc., to take them and their captains under your command, in addition to those already with you, and to proceed with them in quest of the armament preparing by the enemy at Toulon and Genoa. . . . On the subject of supplies, I enclose also a copy of their lordships' order to me, and do require you strictly to comply with the spirit of it, *by considering and treating as hostile any ports within the Mediterranean (those of Sardinia excepted), where provisions or other articles you may be in want of, and which they are enabled to furnish, shall be refused; and you are to treat in like manner, and capture the ships and vessels of powers or states adhering to His Majesty's enemies, or under other circumstances enumerated in the said order, determining to the best of your judgment upon the several cases under this head, that may occur during your command.*¹

Throughout the campaign in the Mediterranean, Nelson was constantly employed in diplomatic negotiations, sometimes under the orders of the commander-in-chief, but more often upon his own initiative. We find frequent reference in his letters, both official and personal, to his diplomatic activities. Thus, writing from the Bay of Naples to Lord Keith, in June, 1799, he says:

. . . . I arrived in the Bay of Naples on the twenty-fourth, when I saw a flag of truce flying on board His Majesty's ship *Seahorse*, Captain Foote, and also on the castles of Uovo and Nuovo. Having on the passage received

¹ Instructions from commander-in-chief to Nelson, dated 21 May, 1798.

letters informing me that an infamous armistice was entered into with the rebels in those castles, to which Captain Foote had put his name, I instantly made the signal to annul the truce, being determined never to give my approbation to any terms with rebels, but that of unconditional submission. . . . I sent Captains Troubridge and Ball instantly to the cardinal vicar-general, to represent to His Eminence my opinion of the infamous terms entered into with the rebels. . . . His Eminence said he would send no papers, that if I pleased I might break the armistice, for that he was tired of his situation. Captain Troubridge then asked His Eminence this plain question: "If Lord Nelson breaks the armistice, will your Eminence assist him in his attack on the castles?" His answer was clear, "I will assist him neither with men or guns." After much communication, His Eminence desired to come on board to speak with me on his situation. I used every argument in my power to convince him that the treaty and armistice was at an end by the arrival of the fleet; but an admiral is no match in talking with a cardinal. I, therefore, gave him my opinion in writing—viz. 'Rear-Admiral Lord Nelson, who arrived in the Bay of Naples on 24 June with the British fleet, found a treaty entered into with the rebels, which he is of opinion ought not to be carried into execution without the approbation of His Sicilian Majesty, Earl St. Vincent, Lord Keith. . . .

As the reduction of the Island of Malta is of the greatest consequence to the interests of the allied powers at war with France, and the withdrawing of the squadron of His Most Faithful Majesty under your command, at this time, from the blockade of that island, will be of the most ruinous consequences to their interests, particularly when an enemy's fleet of thirteen sail of the line are daily expected in those seas, and two sail of the line and several other ships with provisions and stores, for the relief of Malta, are now lading at Toulon; *you are hereby required and directed, in consideration of the above circumstances, and notwithstanding the orders you have received from your court to return to Lisbon, not on any consideration whatsoever to withdraw one man from that island, which may have been landed from the squadron from under your Excellency's command, or detach one ship down the Mediterranean, until further orders from me for that purpose.*²

The order quoted in the foregoing paragraph was accompanied by a private letter to the same effect. Writing to Sir J. St. C. Erskine, on October 11, he says: "I have with great difficulty induced his Sicilian Majesty to permit Sir John Acton to write to Colonel Graham, that he might take five hundred men from the citadel of Messina, for the important service of Malta; and Sir John has wrote (*sic*) in the same strong manner to the Russian admiral at Naples, for seven hundred troops. . . ."³

² Nelson's order to the Marquis de Niza, 3 October, 1799.

³ Sir John Acton, Bart., Neapolitan Prime Minister.

Throughout the period of Nelson's service in the Mediterranean, he was constantly engaged, not only in strictly naval duties, but in public affairs of far-reaching consequence. No officer of to-day would have the hardihood to give orders to the commander of an Allied force, in spite of contrary orders that the latter might have received from his government; nor is it likely that there would be a necessity to do so. Of course it must be borne in mind that the times of Nelson cannot be compared with modern days; the activities of naval officers in the past in purely diplomatic affairs are not introduced for the purpose of showing what a naval officer might be called upon to do, but to show that the genius for naval affairs and administration; the ability to command the respect and loyalty of subordinates, such as Nelson possessed in a marked degree; often go hand in hand with the genius for public affairs, and the courage and firmness necessary for their successful prosecution.

From John Paul Jones, receiving at Brest the first salute to the flag, down to Admiral Dewey and his diplomatic triumph at Manila, when he obtained the moral support of England as opposed to the hostile intentions of the German admiral there present, the history of the United States Navy contains the names of many men no less successful as diplomatists than in their profession. Of them all, John Paul Jones was perhaps the most indefatigable, because he was under the necessity of obtaining for himself from the French court what his own government was unable or unwilling to supply. His activities extended over a long period, from 1778 to 1792, and he used every means to further his ends known to diplomatic practice of his day. While in command of the *Ranger*, he set about to persuade the French Government to provide him with a suitable command. "He wrote to Sartine, the French Minister of Marine, to the King of France, to various influential persons in or about the French court, to French naval officers, to French ladies of influence, to Dr. Franklin, and to others whom he thought to be in a position to help him." (Paullin.) Writing to the king, on October 19, 1778, he says:

After my return to Brest in the American ship of war, the *Ranger*, from the Irish Channel, His Excellency Dr. Franklin informed me by letter, dated June 1st, that M. de Sartine, having a good opinion of my conduct and bravery, had determined, with your Majesty's consent and approbation,

to give me the command of the ship of war the *Indien* which was built at Amsterdam for America, but afterwards for political reasons made the property of France. I was to act with unlimited orders under the commission and flag of America. And the Prince de Nassau proposed to accompany me on the ocean.

I was deeply penetrated with a sense of the honor done me by this proposition, as well as of the favor which your Majesty intended thereby to confer on America, and I accepted the offer with the greater pleasure as the Congress had sent me to Europe in the *Ranger* to command the *Indien*, before the ownership of that vessel was changed.

The minister desired to see me at Versailles to settle future plans of operations, and I attended him for that purpose. I was told that the *Indien* was at the Texel, completely armed and fitted for sea, but the Prince de Nassau was sent express to Holland, and returned with a very different account—the ship was at Amsterdam, and could not be got afloat or armed before the September equinox.

The American plenipotentiaries proposed that I should return to America; and as I had been appointed repeatedly to the chief command of an American squadron to execute secret enterprises, it was not doubted but that Congress would again show me a preference. M. de Sartine, however, thought proper to prevent my departure by writing to the plenipotentiaries (without my knowledge), requesting that I might be permitted to remain in Europe, and that the *Ranger* might be sent back to America under another commander, he having special services which he wished me to execute. The request they readily granted, and I was flattered by the prospect of being enabled to testify by my services my gratitude to your Majesty as the first prince who has so generously acknowledged our independence.

There was an interval of more than three months before the *Indien* could be got afloat. To employ that period usefully, when your Majesty's fleet was ordered to sail from Brest, I proposed to the minister to embark in it as a volunteer, in pursuit of marine knowledge. He objected to this, but at the same time approved of a variety of hints for private enterprises, which I had drawn up for his consideration.

Two gentlemen were appointed to settle with me, the plans that were to be adopted—who gave me assurance that three of the best frigates in France, with two tenders, and a number of boats, should be immediately put under my command, and to pursue such of my own projects as I thought proper; but this fell to nothing, when I believed that your Majesty's signature only was wanting.

Another armament, composed of cutters and small vessels at L'Orient, was proposed to be put under my command, to alarm the coasts of England, and check the Jersey privateers; but happily for me this also failed, and I was saved from ruin and dishonor; for, as I now find, all the vessels sailed slow, and their united force was very insignificant.

The minister then thought fit that I should return to Brest to command the *Lively*, and join some frigates on an expedition from St. Malo to the North Sea. I returned in haste for that purpose, and found that the *Lively*

had been bestowed at Brest, before the minister had mentioned that ship to me at Versailles. This was, however, another fortunate disappointment, as the *Lively* proves, both in sailing and equipment, much inferior to the *Ranger*, but more especially if it be true, as I have since understood, that the minister intended to give the chief command of the expedition to a lieutenant, which would have occasioned a very disagreeable misunderstanding; for, as an officer of the first rank in the merchant marine, who has ever been honored with the favor and friendship of Congress, I can receive orders from no inferior officer whatsoever. My plan was the destruction of the English Baltic fleet, of great consequence to the enemy's marine, and then only protected by a single frigate. I would have held myself responsible for its success had I commanded the expedition.

M. de Sartine afterwards sent orders to Count D'Orvilliers to receive me on board the fleet, agreeable to my former proposal, but the order did not arrive until after the departure of the fleet the last time from Brest, nor was I made acquainted with the circumstance before the fleet returned here.

Thus have I been chained down to shameful inactivity for nearly five months. I have lost the best season of the year, and such opportunities of serving my country and acquiring honor as I cannot again expect this war; and, to my infinite mortification, having no command, I am considered everywhere an officer cast off, and in disgrace for secret reasons.⁴

At the close of the war, Jones was appointed by Congress as an agent to solicit, in France, the payment of all prize money arising from the sale of prizes that he had captured. His appointment was made upon his own solicitation to Congress for the post.

Resolved, That Captain John Paul Jones be, and he hereby is recommended to the Minister plenipotentiary of the United States, at the court of Versailles, as agent to solicit under the direction of the said minister for payment and satisfaction to the officers and crews, for all prizes taken in Europe under his command and to which they are in anywise entitled. And that the said Captain J. P. Jones shall receive the commission usually allowed in such cases out of the money which he shall recover as agent for the said prizes, in full compensation for his services and expenses; provided always that the said Captain J. P. Jones, previous to his entering upon the execution of the said trust shall give to the superintendent of finance, for the benefit of all concerned, sufficient bonds with good security, for the faithful discharge thereof, and for the just payment of the same to the said superintendent of finance, to be by him distributed to those persons who may be entitled thereto.⁵

In accordance with the resolution, Jones was empowered by Franklin to act as agent. His negotiations covered a period of two and a half years, before they were successfully terminated by the

⁴ Paullin: "Diplomatic Negotiations of American Naval Officers."

⁵ Journals Continental Congress, Nov. 1, 1783.

payment of the prize money claims. In the course of his work, he treated with the French Foreign Minister and with the Danish Foreign Minister. Jones' last diplomatic mission was to the dey of Algiers, to treat concerning peace and the ransoming of American prisoners, for which he was chosen by Thomas Jefferson. He died, however, before entering upon the work.

After the close of the Revolution, and the establishment of the American Republic, we find naval officers of the United States actively engaged in Europe in diplomatic affairs. It was, indeed, due directly to their negotiations, in conjunction with their naval duties, that the United States first received serious attention from European statesmen. The work of Preble, in Tripoli and Tunis in the years of 1804 and 1805, convinced not only the pirate states of northern Africa, but the European nations as well, that the United States was a sovereign power amply able and determined to protect its interests and its citizens abroad.

Upon the withdrawal of United States vessels from the Mediterranean, 1807, the United States had no vessels there until 1815. In that year, war was declared upon Algiers, and two American squadrons were sent to the Mediterranean. These were commanded by Commodores Bainbridge and Decatur. Having been authorized by the President to capture Algerine vessels, Decatur, whose squadron arrived first in European waters, and whose flagship carried William Shaler, consul general to the Barbary states, as a passenger, captured a brig and a frigate, the latter the flagship of the Algerine forces. With the two prizes, Decatur appeared off Algiers. With Bainbridge and Shaler he had been authorized to negotiate a treaty with the Dey. The Swedish consul acting as mediary, the captain of the port asked the conditions upon which peace would be made, and they replied by handing him a note from the President and a note signed by themselves (Paullin). The President's note gave the Dey the choice of peace or war: The commissioners informed the Dey that they were prepared to conduct the negotiations. "The Shaler-Decatur treaty was the most liberal treaty that Algiers had ever made with a Christian nation, and marks the beginning of a new era in the relations of that country with the civilized powers." (Paullin.)

Diplomatic successes in the western Mediterranean were followed by negotiations for a treaty with Turkey. Five naval officers were concerned: Commodores William Bainbridge, John

Rodgers, William M. Crane, James Biddle and David Porter. The period of negotiations was from 1784 to 1832. It was not until 1800, however that a naval officer appears in connection with the relations between the United States and Turkey. In that year, Commodore Bainbridge, whose vessel had been impressed into the service of Algiers and sent on a mission to the Turkish capital, discussed with the Capudan Pacha the subject of a treaty between the United States and Turkey. The conversation was:

He expressed a very great desire that a minister should be sent from the United States to effect it. I informed him that there was one already named, who, at present, was in Lisbon, and probably would be here in six months. He said he would write to the ambassador, which letter would be a protection for him while in the Turkish empire, and gave me liberty to recommend any merchant vessel to his protection, which might wish to come here previously to the arrival of the ambassador. I thanked him in the name of the United States for the protection he had been pleased to give the frigate under my command, and for his friendly attentions to myself and officers. I conceive it to be a very fortunate moment to negotiate an advantageous treaty with this government.⁶

Nothing came of Bainbridge's visit to the Sublime Porte, however. William Smith, of Charleston, South Carolina, was the ambassador who had been accredited to Turkey, and although Bainbridge received and transmitted a letter from the Pacha to Smith, the latter made no use of it, because the mission was abandoned. The next visit of an American naval officer to Turkey was not until 26 years later, when Commodore John Rodgers was sent, being then in command of the Mediterranean squadron, to seek an interview with the admiral of the Turkish fleet, which took place at Tenedos, on July 6, 1826. The result was a note, two years later, from the Turkish Government stating that "the delay, until now, must be attributable to destiny," and that "the present period is favorable for such a convention." Rodgers, however, had left the Mediterranean the year before, and his successor, Commodore William Crane, was appointed joint commissioner with David Offley, consul, to conclude a treaty. The negotiations lasted through the winter 1828-29, and ended in failure. Crane's successor, Commodore James Biddle, was therefore appointed by the President, together with Offley and a New York merchant, Charles Rhind, to continue the negotiations, jointly or severally. Nothing

⁶ Harris: Life and Services of Commodore Bainbridge.

was done, however, until the arrival of Rhind, in 1830, when negotiations were commenced that lasted through three months. The terms proposed by the Turks were unfavorable to the United States, and it was only with much difficulty, and finally upon the direct order of the Sultan, that the treaty was drawn in accordance with the wishes of Rhind. The treaty was ratified in the following year, and Commodore David Porter, recently resigned from the navy, was appointed minister and empowered to exchange ratifications. The treaty was proclaimed on February 4, 1832.

We will now consider the relations of the United States in the Pacific, and more especially with the Oriental nations, as carried on by American naval officers. These have been of the most far-reaching importance.

The earliest of these relations were with China, and were brought about directly by the spread of American commerce to the Far East. The first American war vessel to visit China was the *Congress*, commanded by Captain John Dandridge Henley. At that time, the Chinese Government looked with great disfavor upon the arrival of any foreign man-o'-war, and left no stone unturned to hasten its departure. Henley encountered the usual reception at the hands of the Chinese officials, but paid no attention to the urging of the port authorities that they were unable to furnish him with supplies of which he stood in great need. It appears that the Chinese anticipated that the arrival of foreign man-o'-war would cause disturbance, since the British frigate *Alceste*, in 1816, having been denied the privilege of anchoring at Whampoa, proceeded up the river, firing upon the forts and junks that opposed her progress. Henley, however, succeeded in obtaining his supplies, and proceeded to Manila, where he was hospitably received. In his report to the Secretary of the Navy he says in part:

I have met with a very hospitable reception at Manila, one indeed which has far exceeded my most sanguine expectations. The governor himself (Mariano Fernandez de Folgueras) professes the greatest friendship for us, and has tendered his services to render any assistance which I might stand in need of. Under these circumstances I deemed it a fit season to effect the repairs of my mizzenmast, which I informed you in my last had been found to be very defective⁷

Henley returned to Lintin after refitting at Manila, and, having again been denied the services of a comprador, demanded from the

⁷ Captains' Letters, LXX, 32.

government the same privileges accorded to British men of war, but received no reply from the Viceroy. He then weighed anchor, and proceeded up the bay to Chuenpe. The demonstration had the desired effect, and he promptly received his stores.

The second American ship of war to visit China was the *Vincennes*, under the command of Master Commandant William B. Finch. He communicated with the merchants at Canton, and received a statement from them, which he transmitted to the government, respecting the state of trade between the United States and China, and the desirability of periodical visits by American ships of war.

The next noteworthy event was the arrival of Commodore Lawrence Kearney, with the *Constellation* and the *Boston*, sent out to protect American interests, which were considered by the government to be jeopardized by British operations in the vicinity of Canton. The perpetration of several outrages upon Americans caused Kearney to demand redress. He sent a note to Viceroy Ke, by the hand of Lieut. J. G. Reynolds, of the marine corps, dealing with the outrages. He received a conciliatory reply, and proceeded to Hong Kong, where he learned that the British had completed a treaty with the Chinese and obtained important commercial privileges. This led him to undertake to negotiate a similar treaty, by which American merchants might receive the same privileges. His correspondence was directly with the Viceroy.

The address of Commodore Kearney, commander-in-chief of a squadron of United States ships, respectfully represents that he learns with deep interest the high Imperial commissioners deputed to arrange commercial affairs with the British are expected in a short time to arrive in Canton, and that a commercial treaty is to be negotiated to operate in favor of "British merchants" exclusively.

The undersigned is desirous that the attention of the Imperial Government might be called with respect to the commercial interests of the United States, and he hopes the importance of their trade will receive consideration, and their citizens, in that matter, be placed upon the same footing as the merchants of the nation most favored.

The undersigned does not press this matter at present, but, trusting to the good and friendly understanding which exists, he submits the case, and has the honor to be, your Excellency's most obedient servant. (Paullin.)

At Canton he received the reply of the Viceroy:

Ke, guardian of the young prince, member of the Board of War, member of the Imperial Cabinet, and governor of the two Kwang provinces, states,

in reply to the subject of the 10th of the 9th month (13th October), that I have received your polite communication relating to the English commerce. I, the governor, have ever hitherto treated the merchants of every nation with the same kindness. Moreover, the Americans who have come to Canton have had free commerce, month after month, and year after year. These merchants have been better satisfied with their trade than any other nation; and that they have been respectfully observant of the laws, is what the august Emperor has clearly recognized, and I, the governor, also well know. How, then, should I not rather, on the cessation of difficulties with the English, wish to show favor to them? Now, I have ordered the Hong merchants, with the said English nation's merchants, to devise beforehand, and to wait the arrival in Canton of the Imperial commissioners, great ministers of state. When I shall have received the newly devised regulations concerning the free trade of the English, then I, the governor, together with the lieutenant-governor and Tartar-general, will immediately deliberate upon the proper adjustment of the regulations, and will make a representation to the Emperor that he may hear and direct what shall be done.

Decidedly it shall not be permitted that the American merchants shall come to have merely a dry stick (that is, their interests shall be attended to). I, the governor, will not be otherwise disposed than to look up to the great heart of the Emperor in his compassionate regard toward men from afar, that Chinese and foreigners with faith and justice may be mutually united, and forever enjoy reciprocal tranquility, and that it may be granted to each of the resident merchants to obtain profit, and to the people to enjoy life and peace, and universally to participate the blessings of great prosperity, striving to have the same mind.

This is my reply.⁸

Some further correspondence ensued, and resulted in granting to all Western nations the privileges first given to the British. A member of the British commission in China wrote:

The Chinese Government promised, on the representation of the American commodore, Kearny, previous to the treaty of Nanking, that whatever concessions were made to the English should also be granted to the United States. The throwing open of the ports of China to Europe and America was not therefore the result of our policy, but had its origin in the anxious forethought of the Americans, lest we might stipulate for some exclusive privileges.⁹

Thus by the foresight and initiative of a naval officer was the first step taken to open to the world the ports of China; the beginning of the "open-door policy." From that day to this, China has regarded the United States as her firm friend, and no one can

⁸ S. Doc., No. 139, 21-22.

⁹ Foster's Am. Dipl. in the Orient, 76.

doubt but that the swiftly moving events in the Far East will find the United States vitally interested in the problems to be solved.

The most important, and best known diplomatic undertaking in the Pacific, by an American naval officer, in the nineteenth century, is Commodore Perry's mission, which resulted in the opening of Japan, up to that time known only to the few traders and whalers who were permitted to land at certain selected ports.

Unlike the negotiations with China, which were upon the initiative of the officers on the station, Perry's undertaking was most carefully planned by both the Navy and State Departments. The commodore himself selected the officers who accompanied him, and before sailing, acquainted himself with all that was known in those days respecting the character and customs of the Japanese, their manufactures, and arms; and from the whalers of New Bedford he obtained information of the coasts and harbors. His first mission was to obtain from the Japanese assurance of protection and relief of shipwrecked mariners, and others who might be forced to land in Japan; the secondary mission was to negotiate a treaty, and to this end he was supplied with all necessary letters of credence; a letter from the President to the Emperor of Japan, and instructions from the State Department, together with the usual sailing orders. He proceeded by way of the Cape of Good Hope, maturing his plans and completing his preparations on the outward voyage.

On July 8, 1853, Perry arrived in Yedo Bay, with his ships cleared for action, and anchored off the town of Uraga in the afternoon.

Perry's proceedings are a brilliant example of the highest type of diplomacy. Throughout the negotiations he followed a course of action peculiarly fitted to the character of the people with whom he was dealing; and in considering this fact, it must be remembered that until his arrival in the far east his only knowledge of a people then little known was derived from a few books that had been furnished to him by the governor of New York, and from the whaling captains of New Bedford.

The proceedings, given in Perry's narrative, are too well known to require repetition here; it is sufficient to remark that they rank, in foresight, dignity, and firmness, as well as ingenuity, with these of Nelson in the Mediterranean.

Having briefly considered some of the most noteworthy examples of modern times, historically speaking, we turn to the opportunities of the present and the immediate future. All of the great men just considered, were products of the times in which they lived. They were men selected for the important commands, either by the officials of their governments or by their immediate superiors on the spot, and accomplished their diplomatic successes incidentally to their professional duties; or they were appointed, because they possessed peculiar qualifications, to accomplish certain diplomatic missions. That the occasion produces the man is a trite phrase; if the same conditions existed to-day in the conduct of international affairs, without a doubt we would have a Nelson, Jones or Perry ready for the occasion. But times have changed. No longer do we commission our naval officers to negotiate treaties with foreign powers, or leave weighty questions of war and peace, or the concluding of alliances, to the initiative and judgment of one man. War has become too costly and too serious a calamity to mankind; the swiftness of events, the vast problems of modern war, the highly scientific nature of its weapons, undreamed of almost yesterday, require the almost constant and exclusive concentration of those whose business it is to deal with them. Not only the scientific advances of recent years, but the attitude of the peoples of the earth toward warfare and international problems, have caused a complete change. It is only necessary to remember that in Nelson's day, even up to the accession of Queen Victoria, warfare was more or less a personal affair between rulers. The causes, viewed in the light of modern ideas, were trivial in the extreme. Personal ambition, revenge, and hereditary enmities were the most fruitful causes of war. The peoples themselves were concerned only in that they had the costs to pay, the press gangs to avoid. To a considerable extent, war was carried on by professional soldiers and mercenaries, who knew little and cared less of the rights and wrongs of the cause for which they fought.

The field of diplomatic activity open to naval officers is, at present, limited to Latin America and to the Far East. It is impossible for many reasons to discuss affairs in the Pacific, except in a general way; chiefly because of the vastly important affairs in which the United States is deeply concerned, that are now pending. The commonest duty, and an important one, is the paying of

visits of courtesy in foreign ports; the interchange of visits of ceremony with foreign officials, looking to the preservation of friendly relations and intercourse with foreign states. It need hardly be said that in such cases the success of a visit of courtesy ("showing the flag") rests no less upon the commissioned personnel than upon the conduct and appearance of liberty parties; every man who comes in contact with people ashore is, in fact, a representative of his country; and upon his actions; bearing, courtesy and dignity, rests the judgment that will be passed upon his country. This is especially true among the Oriental nations. It is in that part of the world that "face-pidgin" counts more than anywhere else; and it would seem, in the light of recent events, that it is in the Pacific that the United States, and her representatives of the navy, are to be most actively engaged in international affairs. The chief duty now devolving upon our representatives in the Far East is the collection and forwarding of information to the departments concerned, in conjunction with the diplomatic representatives on the spot. Probably the only case that would call for independent action on the part of a naval commander would be a move to protect persons and property, in an emergency.

The same state of affairs obtains in Central America and Mexico. Here we maintain naval forces, for the purpose of showing the flag, and for the protection of lives and property. In a lesser degree there would be a field of independent action for commanding officers than in the Far East, because of the relative nearness to the Navy Department, and because affairs are in a less acute state than in the Far East. The turbulence of local bands of banditti, and the various *de facto* governments frequently set up in the coastwise towns and cities render the presence of naval vessels of great importance to the interests of the United States. The frequent changes of political jurisdiction brought about by the several leaders in these times of revolution in Mexico bring up many questions for solution by the senior naval officer present; especially questions involving the right of asylum. Not the least interesting and important phase of such duty is the intelligence work involved. It is no unusual thing to leave a port, on the west coast of Mexico, and to find, upon returning a few days or weeks later, that the military control of the town has changed hands; that an entirely new set of officials has assumed office, and that a new issue of fiat currency has been printed and put in circulation. The

writer has in mind one such case, when the commandante of a certain town issued an edict to the effect that all store- and hotel-keepers should accept only the money issued by him. The scarcity of silver depreciated the paper money to the point where 100 dollars was worth about 30 cents silver; a dinner cost 50 dollars, or 15 cents silver. Thus the "army," plentifully supplied with the paper money, was subsisted without difficulty, since the merchants were forced to accept the paper. But the same edict provided that liquor could only be purchased with silver; as the rank and file had only paper money, the supply of beer and champagne was reserved for the great man and his staff.

One important diplomatic post open to naval officers has not been mentioned heretofore. It is that of naval attache. This duty comes under the supervision of the office of Naval Intelligence, and the officers concerned report to that office. It is primarily for the purpose of gathering information relating to naval affairs, and officers so engaged are attached to embassies and legations, and are under the orders of the respective ambassadors and ministers. While the posts are of great importance, comparatively few naval officers are detailed to them; whereas there is every prospect that some time or another, all officers will find themselves in the position of representing their country abroad; if not in some vital matter, at least by giving a lasting favorable impression to those with whom they come in contact in the discharge of official business or interchange of social courtesies. Nor can any officer, whatever his rank, afford to lose sight of the fact that, when he is ashore in a foreign country for any purpose, his conduct and bearing are watched and commented upon. He is "always on duty" in that he is always under observation. He may find himself called upon to make a speech; and though he were the youngest graduate in the navy, yet his remarks will find listeners who will be ready to construe them as the opinions and convictions of the American people, and, if he be indiscreet, he may, even by a chance word, make difficulty for himself and cause embarrassment to his country.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THUCYDIDES AND SEA POWER

By CAPTAIN J. M. SCAMMELL, Inf. R. C.

Five centuries before Christ the influence of sea power upon events was as clearly enunciated by Thucydides as 2400 years later by Captain Mahan. That Captain Mahan did not make use of the testimony of Thucydides is certainly due to the fact that he (and "he" may apply with equal force to both men) was a military man, by force of circumstances made into a historian. Captain Mahan, as he himself states, read whatever he could find, and it is probable that a copy of Thucydides did not come to his hand.

Thucydides begins with a brief account of the growth of naval power. Minos, he relates, is the first to whom tradition ascribes the possession of a navy. He made himself master of a great part of what was then termed the Hellenic Sea. Modern archæological research confirms the truth behind this tradition. The importance of Cretan, or Minoan, sea power is now well known.

"The earliest naval engagement on record is that between the Corinthians and Corcyraeans" (B. C. 664). . . . "And the Phocaeans, when they were colonizing Massalia (Marseilles) defeated the Carthaginians on the sea" (B. C. 600). . . . "Later, in the time of Cyrus the first Persian king, and of Cambyses his son, the Ionians had a large navy; they fought with Cyrus and were for a time masters of the sea around their coasts" (B. C. 559-529). . . . "Polykrates, too, who was tyrant of Samos in the reign of Cambyses, had a powerful navy and subdued several of the islands" (B. C. 529-522). . . .

"Sometime afterwards, Darius, strong in the possession of the Phoenician fleet, conquered the islands also" (B. C. 493). "No other maritime power of any consequence arose in Hellas before the expedition of Xerxes. The Aeginetans, Athenians and a few more had small fleets, and these consisted of fifty-oared vessels."

The next great navy was the Athenian: "The ships in all (at Salamis) numbered four hundred, and of these our own (the Athenian) contingent amounted to nearly two-thirds."

The second largest navy was the Corcyraean, of 120 ships. The Corinthian Navy was third in size:

"Hellas has only three considerable navies," said the Corcyraean envoys to Athens, "there is ours, there is yours, and there is the Corinthian."

This was the naval situation when the Peloponnesian war was imminent. Athens and Sparta were in a psychological and political condition that could result only in war. Corinth and Corcyra had already come to blows and the four states were jockeying for position: both Corinth and Corcyra wanted the Athenian alliance.

From the speeches of various statesmen reported in Thucydides, it would appear that all these states understood the significance of sea power perfectly, but it is doubtful if this was really the case, for Thucydides states in his introduction, describing his method of writing, that he puts into the mouths of the speakers such sentiments as he considers appropriate to the circumstances.

In the speech of the Corcyraean envoys it is quite possible that they spoke somewhat as represented, having a definite point to win:

When the proffered alliance is that of a maritime and not of an inland power, it is a far more serious matter to refuse. You should, if possible, allow no one to have a fleet but yourselves; or, if this is impossible, whoever is strongest at sea, make him your friend.

However, in the speech of Archidamus King of Sparta, it is not possible, despite the reported tenor of his speech, to state definitely that he understood fully the complete significance of sea power, but the fact that such sentiments appear in his mouth shows that Thucydides at least understood it. Archidamus' speech is reported as follows:

Perhaps some may be encouraged by the superior equipment and number of our infantry, which will enable us regularly to invade and ravage their lands. But their empire extends to distant countries, and they will be able to introduce supplies by sea. Or again, we may try to stir up revolts among their allies. But these are mostly islanders and we shall have to employ a fleet in their defense as well as in our own. How shall we carry on the war? For if we can neither defeat them at sea nor deprive them of their revenues by which their navy is maintained we shall get the worst of it.

Later Archidamus added:

War is not an affair of arms but of money which gives to arms their use, and which is needed above all things when a continental is fighting against a maritime power.

If it is true that the king really opposed a hasty declaration of war, as Thucydides represents, it could only have been for this reason: he recognized early what bitter experience later demonstrated to the Spartans: an insular maritime power (and Athens was practically an island, due to the long walls to the Piræus) is vulnerable only through a superior fleet, and, in the words of Captain Laur's "*Tsoushima*," "*Une flotte ne s'improvise pas*."

That Pericles, the virtual ruler of Athens, understood sea power cannot be doubted, for not only was he the successor of Themistocles, whose strategy in the Persian wars and whose subsequent policy can leave no possible doubt as to his appreciation of sea power, but also Pericles' policies were quite consistent with the words ascribed to him by the historian.

Taking them in order, Thucydides says:

Themistocles also persuaded the Athenians to finish the Piræus . . . now that the Athenians had become seamen he thought that they had great advantage for the attainment of empire. For he first dared to say that "They must make the sea their domain." . . . The Piræus appeared to him to be of more real consequence than the upper city. He was fond of telling the Athenians that if ever they were hard pressed they should go down to the Piræus and fight the world at sea.

When after their fields had been ravaged and their country homes burned, the Athenians murmured against these reverses under their very eyes, Pericles called them together and said:

I will indicate one element of your superiority which appears to have escaped you although it nearly touches your imperial greatness. I, too, have never mentioned it before, nor would I now, because the claim may seem too arrogant, if I did not see that you were unreasonably depressed. You think that your empire is confined to your allies, but I say that of two divisions of the world accessible to man, the land and the sea, there is one of which you are absolute masters, and have, or may have, the dominion to any extent you please. Neither the Great King nor any nation on earth can hinder a navy like yours from penetrating whithersoever you choose to sail. When we reflect on this great power, houses and lands, of which the loss seems so dreadful to you, are as nothing. We ought not to be troubled about them or think much of them in comparison. They are only the garden of the house, the superfluous ornaments of wealth; and you may be sure that, if we cling to our freedom and preserve that, we shall soon enough recover all the rest.

Thucydides says again of Pericles :

For he told the Athenians that if they would be patient and tend to their navy, and not seek to enlarge their dominion while the war was going on, they would be victorious.

According to the historian, while the Sicilian expedition was ill-advised, it was not even this which led to the final failure of Athenian sea power to subdue the land power of Sparta, although thereby the Athenian Navy was crippled while that of Sparta was daily improving in skill :

Not that the Athenians miscalculated their enemy's power, but they themselves, instead of consulting the interests of the expedition they had sent out, were occupied intriguing against one another for the leadership of the democracy.

Repeatedly Pericles enunciated his faith in the ability of the fleet to preserve the Athenian state and win the war :

For they, if they want fresh territory, must take it by arms, whereas we have an abundance of land both in the islands and on the continent. Reflect, if we were islanders who would be more vulnerable? Let us imagine that we are (islanders) and acting in that spirit let us give up land and houses, but keep a watch over the city and the sea.

Finally, while these quotations from speeches, few of which Thucydides heard, and the substance of which in many cases he could only know vaguely, in a sense express the views of the historian rather than the ideas of the speakers, they show unmistakably that Thucydides had a clear conception of the influence of sea power ; however, we find one very distinct and definite statement of his views on the subject :

. . . . and yet those who applied their energies to the sea obtained a great accession of strength by the increase of their revenues and the extension of their dominion. For they attacked and subjugated the islands, especially when the pressure of population was felt by them. Whereas by land no conflict of any kind which brought increase of power ever occurred.

Captain Mahan never went farther than this.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVAL WAR COLLEGE¹

By REAR ADMIRAL WM. S. SIMS, U. S. Navy,

President, Naval War College

Those of you who may have read the addresses which Admiral Knight delivered to various classes that were received and graduated during his term as president of the college, must have been struck not only by his complete grasp of the subject of the higher education of officers, and by his profound philosophical reflections, but also by his remarkable eloquence and by his peculiar and, for a naval officer, unusual ability in expressing his thoughts in clear, forcible and elegant phrase.

I know of no officer who is his equal in this respect, and this necessarily places his successor at a disadvantage. I shall therefore make no attempt to charm your ears by polished periods or demand your attention to abstract reflection, but shall confine my remarks principally to a plain recital of certain experiences in peace and in war, designed to illustrate by concrete examples some of the practical advantages of the application of War College principles and methods in general service. Whether or not these experiences will interest you will depend upon the value you may place upon them.

But in the first place let me state that it is with sincere regret that I have to apologize to the members of the graduating class, and also to the members of the staff, because of my many unavoidable absences from the college and the time-consuming occupations which have prevented my enjoying the more intimate association with them which I earnestly desired, and fully anticipated when I resumed my duties as president one year ago.

But, though I have not been able to take as active a part in the work of the college as I desired, and as I hope to take hereafter.

¹ Address delivered before the graduation class of June, 1910, at the Naval War College, Newport, R. I., May 22, 1920.

I beg to assure the class that my interest in their studies has been none the less earnest, and that I thoroughly appreciate the spirit with which they have entered into their work and the assistance they have thereby rendered the college in its primary mission, which is the development of principles, and training in the application of these principles to practical situations.

The class now about to be graduated is not only the largest but, in some respects, the most distinguished that has ever taken the course at the college, certainly so in respect of the average rank and experience of its members; and they therefore have it the more in their power to promote the welfare of this institution, and consequently the welfare of the navy as a whole, by the influence which it will be their privilege and their duty to exert when they return to general service.

This service will include many of the navy's most important activities. Some of these will be in positions of command involving various degrees of responsibility for the success of the organizations and the personnel committed to your charge. It has been the object of the college not only to develop and define the principles of naval warfare, but to indicate the methods by which these principles may be applied with the maximum success. I have considered you, and would have you consider yourselves, hardheaded practical men who have been engaged for a year, not in purely academic speculations upon the theory of warfare, but in working out the best methods of increasing the fighting value of the navy as a whole. I am sure that you understand and believe that the teachings of the college are eminently practical, and that the service would be greatly benefited if all of our officers could take the course. As this is manifestly impracticable, it follows that if the whole commissioned personnel of the navy is ever to acquire a working knowledge of the principles and practice of naval warfare, it must be through the effort and influence of the college graduates exerted upon the personnel under their command.

It would, of course, be desirable if more or less systematic instruction and training could be given whenever circumstances permit, as is the case with the considerable personnel now immobilized in the Philadelphia navy yard. These conditions are, however, temporary and wholly exceptional, and it is recognized that such a War College extension would not be practicable in the active fleet to anything like the same degree.

It is hoped, however, that in future the fleet may be much more closely associated with the college than has been possible in the immediate past. The college needs the experience of the fleet and the fleet that of the college. As this association is manifestly essential to the educational mission of the college, and as this is a matter that has at times not been clearly understood, it may be well to consider the following brief analysis of this important subject, with special reference to the geographical location of the college, a matter which has often been a subject of discussion, and upon which you may at any time have occasion to express a professional opinion—wholly disassociated, I hope, from any personal opinion either in prose or in verse as to the desirability of Newport as a place of residence.

This analysis is based upon the mission of the college considered solely from the point of view of the *war efficiency of the fleet*.

The object of a naval establishment is the creation and maintenance of an efficient fleet and its auxiliary services.

A fleet of the most powerful vessels would be of little use in war without a personnel at least as efficient as that of our possible enemies.

The efficiency of a fleet depends chiefly upon the thoroughness with which its officers have been trained in strategy, tactics, and administration.

The principal object of a naval war college is to provide this higher training.

The college can train but few officers each year.

Therefore, the War College training must be gotten into the fleet as extensively and as thoroughly as possible.

The War College cannot be successful without the practical experience that is being continuously developed in the fleet, for without this experience it would gradually fall behind and tend to become theoretical, or "highbrow," and might easily become dangerous.

Therefore, the fleet's experience must be gotten into the War College as thoroughly as possible.

The association between the fleet and the college should therefore be as intimate as it is possible to make it.

This association cannot be intimate if it is carried on solely by correspondence courses; nor can it be made intimate by the occasional exchange of liaison officers. It can be made intimate only by

actual personal intercourse and discussions, that is, by discussions of the teachings of the college by practical fleet men, and by discussions of the practice of the fleet by the college men.

It follows that the War College and the fleet should be in actual physical contact as much of the year as practicable.

From the above it necessarily follows that the War College should be at the very shore line of a harbor which is used extensively by the fleet as a training base during the period of general maneuvers.

To place the War College inland would be largely to defeat the object of getting its training into the fleet.

The distance that the college was placed inland would be immaterial, so long as physical contact was severed.

The severance of physical contact would be practically as complete with the college at Washington as it would with the college at Kansas City.

It is even important that the distance, in time, from the fleet anchorage to the college should be as small as possible, and also that the anchorages should be such that boating would be practicable in any weather except a gale of wind.

But considering now only the influence which each graduate of the college may exert in indoctrinating the personnel with which he may be associated, I beg to present for your consideration a few incidents from my own experience to show what I believe may be accomplished in this way by the application of War College principles and methods, and the danger involved in neglecting them. Some of these relate to pre-war experiences, and some to the influence that those experiences exerted upon the development of doctrine during the Great War.

In 1913 I was given command of the Atlantic Destroyer Flotilla. Captain J. K. Robison commanded the flagship *Divie*, and Captains Pratt and Knox and Commanders Babcock and Daniels were members of the staff. During part of the summer of that year the flotilla was based on Newport, and the War College organized a short course of about three weeks for the captains and other officers of the destroyers. Subsequently we began the development of a flotilla doctrine of night search and attack. Previous to that time there was no doctrine, and such operations had been carried out by operation orders only. I have a copy in my files of such an order. It consists of about 1200 words and two blue

prints, defining and illustrating what each division and each destroyer was to do throughout the maneuver. Manifestly, such a method would be of little use in actual war, and this for the simple reason that, in all but exceptional cases, such an order could not be written and issued to the force in time to be of use in making an attack. We conceived the requirement to be that we should be able, during a maneuver, to launch the flotilla against the "enemy" at any time, upon a few minutes notice, even though none of the destroyers were within sight of the flotilla flagship. This necessitated the development of a doctrine so complete and so well understood that every unit, every division and the whole force could successfully carry out the attack upon the receipt of a very brief wireless order. I will not take your time by a detailed description of how this doctrine was developed, but it is essential to note that this can be successfully done only by the process of trial and error carried out after full discussion by those who have the actual experience in maneuvers.

Let me accentuate these two points, namely, that success depends upon (1) utilizing the combined experiences of all persons actually engaged in the problem to be solved, and (2) co-ordinating these experiences by means of continuous conferences for the purpose of progressively modifying and amending the doctrine as additional practical experience is gained.

As I believe that the importance of this process cannot be overestimated, I will add the following examples to illustrate what can be achieved by it in preparation for war, and how great is the value of this experience in actual war, especially war of an unusual kind.

In this connection it is important to define the limit of the part that should be taken in the development of tactical doctrine of this kind by the officer in chief command. This part should be restricted to defining the mission, to stating what it is desired to accomplish, and then to affording the opportunity for conferences, discussions and practical experiments. In the case of the flotilla in 1913, the destroyer captains began by working out a doctrine by means of the game board. This was at once tried out by a maneuver at sea and found, as we expected, to be half wrong. This sea maneuver was discussed around the game board and the doctrine modified, and tried out again; and after each maneuver similar modifications were made until the doctrine was in such shape that

the flotilla was able to inform the commander-in-chief of the battle fleet that it believed it could carry out a successful attack under any practicable conditions, and subsequent maneuvers against the fleet proved this estimate to be correct.

One such maneuver will illustrate what is perhaps an extreme case of a very brief operation order executed under well-understood general instructions prescribed in a doctrine. I will not attempt at this time a comprehensive definition of doctrine. The term is here used to indicate the prescribed actions of the force in carrying out various war operations.

The Atlantic battleship fleet left Guantanamo Bay early one morning and directed the flotilla to be off Guantanamo about sundown. At 6 p. m. the following order was received: "Enemy passed Navassa Island 3 p. m. heading to northward. Attack at once." Within a few minutes the following wireless order was sent to the flotilla: "Deploy, Lat. so and so, Long. so and so, to Lat. so and so, Long. so and so, 9 p. m., course 105, speed 20 knots." That order would mean nothing to anyone not in possession of the doctrine. To the flotilla it meant that each destroyer was to arrive at her designated position on the scouting line at 9 p. m.; thence steam at 20 knots on course 105; that the first vessel making contact would broadcast the position, speed, and course of the fleet; that the two vessels next to her in line would assist in tracking, all keeping out of gun range; that all other vessels would proceed to the rendezvous of their divisions at designated position ahead and astern of the enemy, and there await the order to drop surface mines, or torpedo the screen, or attack the main body. After the destroyers were on their way to the positions designated in the doctrine, an information signal was sent informing them that the enemy had passed Navassa Island at 3 p. m., heading to the northward. This night maneuver was performed a number of times, and its success was demonstrated upon one occasion by firing 18 actual torpedoes and making at least 11 hits.

The so-called doctrine provided for the various war activities of the flotilla besides night search and attack, here used as an illustration of the principle involved; and that this doctrine was a practical one was shown by the fact that destroyers that had taken no part in its development were successful in carrying it out.

The points to be specially noted are that a successful doctrine was developed by the commanding officers of the destroyers; that the first draft of the doctrine was half wrong, thus showing that it could not have been successfully formulated by the staff alone. The importance of these points cannot be too strongly accentuated, as I had occasion to learn by sad experience during the war; and in this connection I wish to invite special attention to the influence that this training in the formulation of doctrine during peace had upon the conduct of our naval forces during the war, and to point out the difference between the success attained by forces operating under a progressively developing doctrine and the relative failure of forces whenever controlled by operation orders alone.

The first forces to arrive in Europe were 35 destroyers based on Queenstown. These were retained under my personal command for reasons that need not be specified here. They were required to use the flotilla doctrine just described in so far as it applied, and the night search methods proved of great value in searching for, making contact with, and concentrating upon inbound convoys. Upon no occasion did these destroyer escorts fail to meet and assemble upon their designated convoys at the appointed rendezvous, though there were not a few instances of failure in other forces. But the principal benefit derived from their previous training was in the confidence it gave them in their ability to formulate a doctrine to govern operations under the novel conditions of the anti-submarine campaign; and not only formulate it but progressively develop it to correspond to the changing tactics of the enemy submarines. To this end it was enjoined upon them to hold conferences to develop doctrine, and to repeat these conferences as often as practicable in order to modify the doctrine as required by their accumulating experience. In this way they developed a doctrine covering patrol operations, and later one covering all the operations of convoy, in which we had had no experience, though our previous experience in screening was of considerable value.

In this way all doctrine was developed solely by the operating forces, whether destroyers, yachts, cruisers, subchasers or airplanes, and whether engaged in patrolling, escorting troop or merchant convoys, hunting submarines with hydrophone appliances, or any other operations. The general headquarters in London required doctrine to be developed and the results reported. These results were continuously sent out to all bases and stations, with

occasional suggestions for consideration, but there was never any interference in the actual development.

This process was, of course, very gradual, and considerable experience with the peculiar conditions of warfare was required before definite instructions could be drawn up and the results circulated. During this interval different methods were employed at other bases, and in some instances the development of doctrine was delayed, and meanwhile the forces were handled under operation orders alone. Also, incredible as it may seem, there were instances of War College graduates who expressed the opinion that doctrine, principles of organization, etc., were only War College stuff, and of no use in war. The inevitable result was friction in the organizations, misunderstanding of the orders issued, relative inefficiency, and some very regrettable incidents.

At the expense of what, I am afraid, has been a somewhat tedious explanation, I have tried to bring out what I consider the great value of continuous conferences carried out by one's subordinates for the purpose of getting up general instructions, or doctrine, covering any type of operations or any activities in which they may be engaged. The point is that this is not only, I believe, the best way to achieve the immediate results required, but it is excellent training for the subordinates. As the methods thus devised are the sum of their various experiences, combined with that of their seniors, they regard these methods as their own, and carry them out as theirs with a spirit that cannot be inspired by instructions imposed upon them. Moreover, the faults that develop in practice are recognized as theirs and not those of their commander. The War College is a continuous conference differing in extent only from the local conferences in question. Experience shows that officers always welcome the conference method. They recognize it as practical common sense. From this to considering the War College in the same category requires but a word of explanation on the part of their commander.

If this reasoning appeals to you, you will therefore recognize that you have it in your power to implant in the minds of your subordinates the conviction that doctrine is not a highbrow term, and that the college training is really of a practical kind. I could mention the names of officers who had not been to the War College, but who nevertheless responded so thoroughly to training of the kind just described that they became perfectly sound in the practice

of War College principles and methods. This does not mean that they were educated officers in a military sense, but only that they thoroughly understood fundamental principles, and practiced them in carrying out their duties; and when all of our officers have achieved this degree of knowledge and training our service will be vastly more efficient—but not until then, because, no matter how sound and able the leaders may be, they cannot bring their forces to maximum efficiency unless the bulk of their officers understand and believe in the principles and methods they wish to apply.

I am aware that it may appear to some of you that I am a bit hipped upon this subject, and that the service opinion of, and confidence in, the college is more satisfactory than I believe it to be. But I can assure you that extended experience, especially in the late war, has shown me that continuous effort in convincing the service of the usefulness of the college is now, and will for some time continue to be, necessary, at least until such time as it is possible to assign War College graduates to all important commands, both ashore and afloat, and thus extend War College principles through official practice. I could give you numerous instances in substantiation of this statement. Moreover, I am sorry to say, I could give you quite a number of instances of War College graduates who either did not believe in, or had not grasped, the primary principles of warfare, and who in consequence violated some, or even all, of them under war conditions. The almost inevitable result was instances of marked inefficiency, and in some cases serious losses.

One of the commonest faults exhibited by commanding officers during the war was due to a lack of understanding of, or appreciation of, the advantages of a sound organization, and a pronounced disposition to prescribe all possible details. This failure to entrust responsibility and commensurate authority to subordinates was in some cases such as materially to decrease efficiency. Some officers in responsible positions found themselves too much occupied properly to perform the functions of command, but still they insisted upon prescribing the details of operations and even of administration. They seemed unable to shake off the habits acquired while acting as executive officer. They were not only unwilling to trust their subordinates to make independent decisions in matters concerning their own departments, but even regarded such decisions as an infringement of their rights and a reflection upon their competence to handle their job.

It is, of course, admitted that where the commander must in war assume responsibility for the acts of his subordinates, it is not always an easy matter to refrain from assuming the personal direction of some of their activities, particularly when these activities involve matters of grave importance; but it must inevitably diminish the sense of responsibility of the subordinate and his confidence in his own decisions, and to some degree his confidence in the decisions of his commander; and it not infrequently results in misunderstandings and friction. This is particularly accentuated where the command is increasing at such a rate that the task of handling its details is getting beyond the capacity of any one man, no matter how able and energetic. This condition is one of such danger during war that it should not be permitted to arise under any circumstances. Moreover, and this is the essential point, it should not be allowed to arise in peace, because it would be false training for war, both for the commander and for his personnel—and our primary mission in time of peace is preparation for war, both as regards our material and the methods pursued by our personnel.

Though a failure to establish a sound organization, and particularly a failure to develop and apply doctrine in war, must necessarily result in a degree of inefficiency corresponding roughly to the importance of the command, there are other causes of inefficiency that are very sharply brought out when forces are operating under war conditions. They are of a more personal kind, as they concern defects in military character and misunderstanding of the related subject of the psychology of war.

These causes of inefficiency are apparent enough in time of peace, but not until their effect is observed under the strain of responsibility can we fully realize how easily they may result in serious loss of life and property, or even in military disaster.

I of course do not intend to comment at length upon these subjects. You all understand their importance. But I think it may be useful to illustrate by certain examples the friction that may be caused by unwise military behavior. You are all familiar with what is popularly called the "impossible" man—he who believes that you should never fail to punish all faults; that you should never consult a subordinate, but tell him he is not paid to think; that an executive officer should not be on speaking terms with any of the watch officers, etc. Fortunately this extreme type is now

rare, but there are many varieties of a milder sort, and the aggregate of trouble they make in an organization is really serious. Generally speaking, the worst types are men of ability and experience who understand the details of their business, but who have no sympathy with those less well endowed, and who seem more concerned with advertising their superior knowledge at the expense of their subordinates than in using their brains and experience to establish cordial relations with the latter and to "get on with the war." In several instances men of this type had to be transferred to other duty, for, though they perfectly well understood their defects, they did not respond to admonition because of lack of will power to overcome what had become an ingrained habit in time of peace. Others blamed their subordinates as a class, because they conscientiously believed that their own methods of command were correct. But they acknowledged that they had made no estimate of the situation involved in their relations with their personnel. They promptly did so, and thereby corrected their defects, and had no further trouble.

Let me state here, very specifically, that I am only pointing out a few sad cases and their effect upon efficiency in war, and that I am not criticizing the efficiency of the personnel of the navy. Barring a very few such cases, our navy personnel not only responded to all requirements, but exceeded our most sanguine expectations in the endurance, zeal and loyal initiative they displayed, and this applies not only to the forces in the war zone, but to the navy in general, and particularly to the very intelligent and skilful handling of the transport services in effective cooperation with the forces abroad. But I simply wish to point out the errors that were made, because in war the effect of a few such errors may lead to very regrettable results. I invite your earnest consideration of them in order that you may in turn bring them to the attention of the personnel that may be entrusted to your charge.

The above remarks have special reference to the influence upon war efficiency of correct military character, and to the opportunity of commanding officers to instruct their personnel in this respect. But, in addition to this, let me invite your attention to another opportunity, and that is to explain to your officers the great influence which it is in their power to exert, for good or for evil, upon the essential support which the military forces shall receive from the civil population. This is a matter which concerns the people's

confidence or lack of confidence in their military leaders. Much of this influence is exerted through the unofficial opinions expressed by officers to their civilian acquaintances, and by the reflection of these opinions in the press. That these opinions had a marked influence upon the conduct of the late war there can be no doubt, nor can there be any doubt that this influence was detrimental. As a matter of fact, it could hardly have been otherwise, because the great mass of such opinions must necessarily have been based upon incomplete information, and much even of this information was necessarily erroneous. It is, of course, perfectly natural that all officers should have opinions upon the conduct of a war. It is equally natural that some should not resist the temptation to express these opinions when questioned by anxious relatives or civilian friends; and the opinions thus expressed appeared in many grotesquely mistaken editorials criticizing the strategy and conduct of our military forces on land and on the sea, and these editorials were usually based upon the expressed authority of so-called "experts." You have doubtless noticed that newspapers never quote any authority less than that of an expert.

I believe that few people know the extent to which public opinion was formed in this manner, or the extent to which such necessarily erroneous opinions actually influenced even many of the most important government officials, both in our country and in allied countries. I have in my possession many letters upon this subject. Some are from leading members of the government, some from naval officers of various grades engaged in different branches of the navy's activities, and some from civilians in various walks of life. All were evidently written in entire good faith and with an earnest desire to correct what appeared to the writers to be fundamental errors of strategy or tactics, or both. Almost none approved of the military conduct of the war, or expressed any doubt as to the soundness of the recommendations they advanced. If it would be proper for me to quote these letters, I venture to say that there would remain in your minds no doubt as to the danger of such uninformed opinions. Without exception they showed an ignorance of the conditions governing the naval campaign, which was not excusable in some cases, though perfectly natural in others. Practically all of the criticisms and recommendations were those of naval officers, or were based upon the opinions of naval officers. This was not confined to our own

country, but was equally true of allied officers. The general impression conveyed was that very few naval officers had refrained from expressing critical opinions when questioned by acquaintances or even strangers, and that many had even volunteered their opinions in mixed company. A few examples will suffice to illustrate the nature of these letters.

Perhaps the most numerous and insistent of the critics pointed out the crass stupidity of hunting and fighting enemy submarines in the open sea, rather than capturing and destroying their bases or blocking their egress therefrom. Others expressed similar opinions concerning the failure of the allied navies to bombard the enemy back from the Belgian coast—all this in apparently total ignorance of the history of naval warfare or of the fact that modern guns of heavy caliber, concealed in pits on shore, greatly outrange any guns afloat. You would be surprised, I am sure, if I were to mention the names, positions, and grades of the civilian and naval authors of these criticisms. These were, of course, easily refuted; but to me the most disquieting feature of the matter was the number of letters received from distressed civilians stating that such and such a naval officer had told them of the various fatal mistakes that were being made in the conduct of the war. These civilian letters referred for their authority to regular naval officers of all grades, from rear admiral to ensign, and of course also to officers long since retired, and to reserve officers just enrolled; for apparently all these classes of officers expressed opinions with equal confidence. As far as time would permit these anxious citizens were reassured; though not, however, with the hope of counteracting the evil, for these letters were but an indication of the many thousands of equally distressed citizens who did not write, but passed on to others these opinions which eventually appeared in the press to influence all those who were not accustomed to thinking for themselves, that is to say, the great majority. The result was almost wholly erroneous information upon this whole subject, and one regrettable result was the paying of many millions of insurance against losses at sea, bombardments of coast cities and even bombing of inland cities. One poor mother of a boy serving in the destroyer forces abroad wrote a tearful letter imploring me not to let her beloved son starve to death. She had been informed that the food supply was failing.

An attempt was made to reassure the public through interviews and letters in the press, but this had little effect in comparison with the great mass of information being circulated in the manner above indicated. The consequence was that the public was led to believe that the seas were swarming with submarines; that they were attacking our troop and merchant convoys in flotillas; that our coast cities would be bombarded; that submarine bases doubtless had been established on our side of the ocean; that fuel supplies had been planted on various parts of our coast; and even, as shown by the darkening of New York, that submarines might bring over airplanes to bomb our cities; and that these operations were being inflicted upon us because the leaders of the allied navies were too stupid to realize that they could be successfully counteracted by simply destroying the submarine bases, or establishing a patrol lane across the Atlantic Ocean, or suspending nets or steel plates from the sides of all vessels, or building unsinkable, compartmented ships, or shooting down the submarines before they could fire their torpedoes, or so painting all ships as to render them quite invisible, and literally hundreds of other similar methods. You can readily imagine the effect upon the spirit of those actually engaged in this peculiar warfare.

Considering the importance of a sound and confident public opinion supporting the military forces at the front, what is the lesson to be derived from all this? Manifestly, it is that all officers should be warned of the danger of such a condition; and should be informed that it could have been avoided, or greatly minimized, if at the outbreak of war it had been enjoined upon all officers to make, each for himself, an estimate of his own situation as regards his opinions, about as follows:

The Allies are fighting for their lives. They realize that they must prevent the enemy submarines cutting their wholly essential sea lines of communication. The responsible officials of the Allied navies are presumably able men. They at least have all of the information and experience available concerning the anti-submarine warfare, the conditions that govern it, and the military situation in general, little of which they can publish without giving valuable information to the enemy. Therefore, there must be good reason for what they have done, are now doing, or have left undone. I have practically none of this information and experience, and much of such as I have is probably in error. Therefore, as full and accurate information is essential to a correct military decision, my opinion is probably unsound.

Decision.—When asked for my opinion, I should have the courage to say: "I do not know. We should trust our leaders and their associates and do our best to help them to get on with the war."

If we can convince the great body of our officers that that is the logical and necessary line of conduct to adopt under war conditions, I can assure you that it will greatly increase the morale of our personnel, not to mention greatly diminish the anxiety of those who are charged with the responsibility for the successful operation of our forces.

Now I hope that I have not conveyed the impression that I have intended to lecture officers of your standing and experience upon your duties in general. I have had no such intention. But as the requirements of my service have afforded me certain experiences in war that have not been available to all of you, especially the experience of responsible command in its relation to widely distributed groups of forces, it has seemed to me that some of these experiences might be useful to you in future. I am led to this conviction through having been forced by circumstances to note the enormous difference in the point of view of one who studies the relation between commanders and subordinates as an abstract proposition, and one who actually experiences the effect of various phases of this relation under the strain of responsibility in war.

Quite apart from all question of nautical knowledge and skill, I have tried to indicate the sense of security and confidence that was inspired by sound military principles, and by the display of initiative, loyalty, and military character. I doubt whether it is possible fully to appreciate the importance of these qualities without having had actual war experience of their inestimable value. Under the war conditions indicated one sees them, not as abstract ideas, but as vitally essential forces. They mean that the commander may rest assured that he may confidently rely upon his responsible subordinates to use the brains and experience of their entire commands in carrying out their missions; that thorough doctrines will be developed and progressively modified to correspond to the changing phases of the local campaigns; that there will be harmonious working of sound organizations, complete loyalty to their commanders and of the latter to the central organization.

If you gentlemen can succeed in implanting these fundamental principles firmly in the minds of your subordinates, you will have

performed a service of great value to the future of the War College and to the fighting efficiency of our navy.

Once the principles comprised in doctrine, initiative, loyalty and military character are understood, accepted and applied, an officer has laid the sure foundation upon which to build a sound military education; and, with the guidance and assistance that you are qualified to give, all of your officers who realize their obligations to the navy and to the nation will acquire this education and thereby fit themselves for the very responsible duties of so preparing the navy in time of peace that it will at all times be ready for instant service in time of war.

And now, a word as to the scope of the studies and exercises carried out at the college. I am aware, of course, of the practically universal opinion that the course of one year is too short to permit the students to acquire a comprehensive knowledge of the various subjects undertaken. This is perfectly true, but it is a condition imposed by circumstances which we cannot now control. It is impracticable to lengthen the course, at least until such time as the Congress provides a surplus of officers to enable more extensive instruction to be carried out. It would be unwise to cut out any of the subjects which are interdependent, such as strategy, tactics, policy, command, and so forth. But even if all other subjects were eliminated, the field of those subjects that would remain is so vast that they cannot be covered, let alone digested, within any practicable length of course.

The truth of the matter is that the art of war is really a life study. A glance over the list of books that should be read will alone show this. Therefore, all that the college can hope to do is to establish in the minds of its students a clear conception of the principles involved, and to carry out such training in the application of these principles as time will permit. From this it follows that no student is at all justified in assuming that the college does, or possibly could, complete his military education. The course is, however, sufficiently comprehensive to show him how much he has yet to learn, and to indicate the direction and scope of the studies that should be pursued.

In conclusion I wish to thank the members of the class for the very cordial manner in which they have cooperated with the staff in the interests of the college. Their attitude in this respect has been that which the college desires. They have given it the benefit

of their various experiences in the form of constructive criticism, both of our aims and of the methods by which we have sought to attain them. As this critical attitude is necessary on the part of each class in order to jar the college out of a routine into which it is liable to fall, you have very properly not allowed yourselves to be influenced too much by diffidence in expressing these criticisms. Had you done so, both you and the college would have been the losers, for the college is but a part of the service; the staff of to-day is recruited from the class of yesterday, and will in its turn take its new members from the class of to-morrow, and the friendly exchange of opinions and experience is a necessary element of their development. The college of to-day is what you and your predecessors have made it. Therefore the diplomas which it is my privilege to present to you really represent what you have done for yourselves.

We have not helped you any more than you have helped us; and, both personally and upon the part of the staff, I thank you most sincerely for your cooperation; and if you will tell the officers of the service with whom you may come in contact what this institution has meant to you, I am sure that the staff will feel that their work has been amply rewarded.

May your future duty be such as to cause you to forget the more or less strenuous work of the past year, and also any inconveniences that you may have experienced during your isolation from the associations and normal activities of navy life. While we shall miss you sadly, we shall hope that we may be remembered as kindly as possible under the circumstances.

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A NEW METHOD IN COASTAL NAVIGATION

By H. B. GOODWIN

Amongst the tables appended to the "American Practical Navigator" are two tables, 5A and 5B, which have for their object the determination of the distance of the ship from a fixed point of which two bearings have been taken, the course and distance run between the observations having been carefully noted. But it is pointed out in the body of the work that the fix obtained by two bearings of the same object will be in error unless the course and distance are correctly estimated, the course "made good" and the distance "over the ground" being essential to accuracy in the result, and the utility of such tables, having regard to the difficulty of estimating accurately the effects of wind and current, is very greatly restricted. An extension of the same problem has recently been proposed, whereby, if a third bearing of the same object is added, the course "made good" over the ground may be deduced, upon the assumption that the speed of the ship has been uniform during the interval covered by the observations, and that the effect of wind and current has also remained fairly constant during the same period. Moreover, if the distance of the ship from the object is known at the first observation, the distance in her final position may be found by multiplication by means of a coefficient added to the tables. The new process is proposed in a little work of Captain Edmonds, of Sydney, Australia.¹ The method devised by Captain Edmonds depends upon this hypothesis, that for a limited period the track of a ship under the influence of her own way through the water, and of the wind and possible current, may be represented by a straight line, and, as he points out, the problem may be divided into three cases:

¹ Course Angle Tables. By Captain H. H. Edmonds. (Turner and Henderson, Sydney).

- (1) When the bearings are taken at equal angular intervals.
- (2) When the intervals of time are equal, but the differences of bearing are unequal.
- (3) When the intervals of time and differences of bearing are both unequal.

Problems (1) and (2) may of course be regarded as special cases of the general problem of head (3). The tables required to deal satisfactorily with this general problem would be too bulky for the object in view, and the choice is limited therefore to heads (1) and (2). Of these the author selects the former, and the method of procedure is to observe the bearing of an object and after a given time of m minutes to take a second bearing. A third bearing of the same object is taken after a further interval of n minutes, differing from the second by the same interval of azimuth as does the second from first, and this completes the series of observations.

The course "made good" is then deduced by means of a table arranged somewhat as follows:

Quotient first time by second	Common interval in bearing		
	23°	28°	34°
I. 48	42.6	42.1	40.1
I. 44	44.2	43.4	41.2
I. 40	45.6	44.6	42.1
I. 36	47.1	45.8	43.2
I. 33	48.4	47.0	44.3

The table, it will be seen, has two arguments, viz.: The first time in minutes divided by the second time, or $\frac{m}{n}$, and the common interval of bearing. Entering the table with the appropriate values of these, the inclination of the course "made good" to the first line of bearing is taken out at sight.

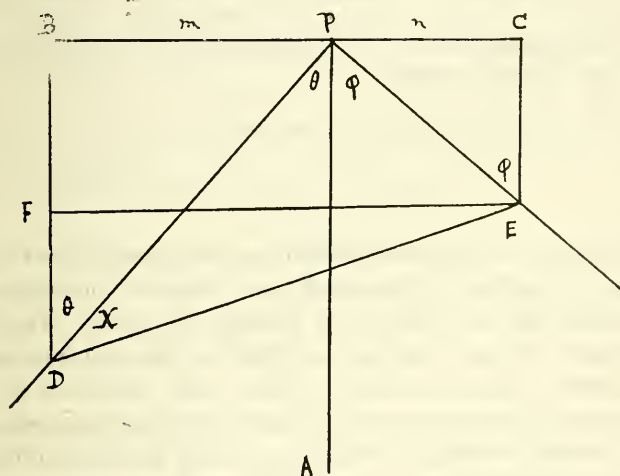
The general problem involved may be stated as follows: From a ship steaming on a given course by compass at uniform speed the bearing of a lighthouse is observed. After an interval of m minutes a second bearing is taken, and again after a further interval of n minutes a third bearing. If the first bearing differs from the second by θ° , and the second from the third by ϕ° , find the true course made good over the ground.

The problem may be dealt with geometrically as follows:

Let P be the point of which the bearings are observed, and let PA be the middle line of bearing. Through P draw a straight line at right angles to PA , and upon any convenient scale take PB, PC proportional to m, n , the numbers of minutes between the two pairs of observations.

At P lay off angles equal to θ and ϕ , respectively, and through B, C draw BD, CE intersecting the lines of bearing for θ, ϕ in D, E .

Then if the points D, E are joined, the straight line DE will represent the true course made good over the ground.



From the diagram given it is easy to deduce formulæ for finding the direction of the course made good.

Let us suppose that the true course is inclined to the first line of bearing at an angle X .

Then, from the diagram, we have

$$FD = BD - FB = BD - CE.$$

Whence

$$FE \cot (\theta + X) = (m + n) \cot (\theta + X) = m \cot \theta - n \cot \phi.$$

From this equation, since m, n, θ, ϕ are known quantities, $(\theta + X)$, and therefore X , may be obtained.

With regard to the particular cases of the problem. If $\theta = \phi$, we have

$$\begin{aligned}\cot(\theta + X) &= \frac{m-n}{m+n} \cot \theta \\ &= \frac{1 - \frac{n}{m}}{1 + \frac{n}{m}} \cot \theta \quad \text{or} \quad \frac{\frac{m}{n} - 1}{\frac{m}{n} + 1} \cot \theta.\end{aligned}$$

From this formula it is evident that the values of X may be arranged in the form of a table having $\frac{n}{m}$, or $\frac{m}{n}$, and θ , as arguments. An extract from such a table has been given above. If $m = n$ the formula becomes

$$2m \cot(\theta + X) = m(\cot \theta - \cot \phi),$$

or

$$\cot(\theta + X) = \frac{1}{2}(\cot \theta - \cot \phi).$$

As has been already mentioned Captain Edmonds restricts his attention to the first of the special cases, in which the angles θ , ϕ , representing the two changes of bearing, are equal. The alternative case, in which bearings are observed at equal intervals of time, seems to have advantages of its own, inasmuch as it is obviously more simple to observe a bearing at a given moment, than to wait, watch in hand, at the compass, until a particular bearing comes on. Besides this the trouble of calculating a proportion is saved when the intervals are equal. In the remarks which follow, therefore, the second case, for equal intervals of time, will be chiefly kept in view.

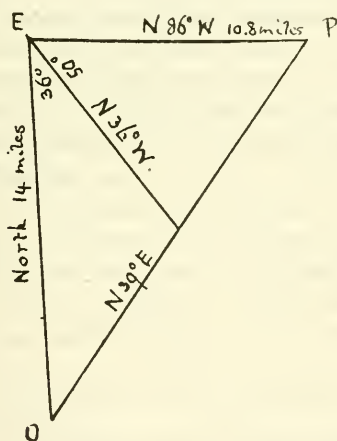
From what has been said the construction of the form of table appropriate to this case, in which the intervals of time between the pairs of bearings are equal, will perhaps be sufficiently intelligible. On the left we have the interval in azimuth for the first and second observations, and at the top the corresponding interval between second and third. When, as will generally be the case, the distance of ship from light is more or less accurately known at the first observation, the factor or coefficient given in the column headed "F," multiplied into this distance, will give the distance of the ship in her final position. The table is used in practice as follows:

INCLINATION TO FIRST LINE OF BEARING

Difference between first and second bearings	Difference between second and third bearings					
	52°	F	50°	F	48°	F
•	°		°		°	
45	38.8	.90	40.4	.92	42.2	.95
40	38.4	.82	40.0	.84	41.7	.87
38	38.0	.78	39.6	.81	41.3	.83
36	37.4	.75	39.0	.77	40.6	.79
34	36.7	.71	38.2	.73	39.8	.75

F is the factor by which the first distance from light is to be multiplied, in order to obtain the distance in final position.

The Eddystone light (Lat. $50^{\circ} 11' N.$, Long. $4^{\circ} 16' W.$) bore due north, latitude by meridian altitude of the star Betelgeuse being $49^{\circ} 57' N.$ Ship steaming N. $30^{\circ} E.$ (true) 20 knots. After 18 minutes the light bore N. $36^{\circ} W.$, and again 18 minutes later bore N. $86^{\circ} W.$ Find the true course made good, and distance from light in final position.



Here θ = angle between first and second bearings = 36° .

ϕ = angle between second and third bearings =

$$86^{\circ} - 36^{\circ} = 50^{\circ}.$$

From table, for 36° at side, 50° at top, X the angle of inclination to first bearing = 39° , and course made good is N. $39^{\circ} E.$

To find the distance from light. At the first observation, ship being due south of light, the distance = $50^{\circ} 11' N. - 49^{\circ} 57' N. = 14'$. Then distance in final position = $14' \times F = 14' \times .77 = 10.78$ miles.

DEGREE OF DEPENDENCE OF THE METHOD

The question naturally suggests itself, to what extent will errors in the bearings affect the accuracy of the resulting course made good. Such errors may be divided into three classes:

(1) Errors affecting the whole of the bearings observed due to an inaccurate value of the deviation of compass.

(2) Error in the observation of first or third bearing.

(3) Error in the second bearing.

With regard to the first source of error, since the value of X , the inclination to first line of bearing, is deduced from the differences of bearing, and since, with the ship's head steady upon a given azimuth throughout, each bearing will be affected to the same extent, the actual value of X is not altered. The true course obtained, therefore, is increased or diminished by the amount of error in the deviation. In the ordinary fix by cross-bearings, it may be observed, the place of ship obtained is affected by an error in deviation in much the same manner.

In the case of the errors which come under headings (2) and (3) it is necessary to make a distinction for the following reason. An accidental error in the first bearing will only affect the *first* difference of bearing, provided that the second bearing is correctly observed. Similarly first and second bearings being supposed free from error, an error in third bearing has to do only with the *second* difference of bearing. But an error in the second bearing is on a different footing, since it throws out to some extent both of the differences, so that if the first becomes too large, the other is too small, and *vice versa*. The effect in this case therefore is cumulative, and the error is of greater importance.

EXPRESSION FOR THE ERROR IN FIRST OR THIRD BEARING

Let $d\theta$ represent an error in one of these, viz., in the first to be observed, and let dX be the consequent error in the angle of inclination.

From the equation

$$\cot(\theta + X) = \frac{1}{2}(\cot \theta - \cot \phi)$$

we obtain by differentiation, regarding ϕ as a constant,

$$dX = \left\{ \frac{\operatorname{cosec}^2 \theta \sin^2(\theta + X)}{2} - 1 \right\} d\theta.$$

Applying this formula in the practical example already worked, we shall have

$$\theta = 36^\circ,$$

$$\theta + X = 36^\circ + 39^\circ = 75^\circ.$$

Then

Log cosec θ	.2308	$L \sin (\theta + X)$	9.9849
	2		2
Log cosec ² θ	.4616	$L \sin^2(\theta + X)$	9.9698
$L \sin^2(\theta + X)$	9.9698		
Sum	10.4314		
	2) 2.7		
	1.35		
	- 1		
	.35		

Thus the value of the expression within the brackets is .35, and if we wish to obtain the amount of error for 2° , or $120'$, the tabular interval in argument, we have

$$120' \times .35 = 42' \text{ or } .7^\circ.$$

From the table we have for first differences of bearing 36° and 38° , second difference 50° ,

$$39.6^\circ - 39^\circ = .6^\circ,$$

and for first differences 36° and 34° , second difference, as before, 50° ,

$$39^\circ - 38.2^\circ = .8^\circ$$

so that the mean of the two, or $\frac{1}{2}(.8^\circ + .6^\circ) = .7^\circ$, which is the value furnished by the formula.

In the same way regarding ϕ as the variable, and θ as constant, we may obtain a similar expression for the error in third bearing. The effect of such accidental errors may tend to counteract one another, or the reverse, as the case may be.

With regard to the important second bearing, particular care is possible in its observation, since it has not to be taken at a given moment, but the observer need not "stop," for the assistant standing by to note the time of the observation, until satisfied that a reliable bearing of the object has been obtained. As the author of "Course Angle Tables" points out in the little work in which this

interesting problem is for the first time presented in a simple and practical form, it is likely to be of great service in the navigation of the air. For it is a feature of the process that it is not at all necessary to identify on the chart the particular object observed. Three bearings of any mountain peak or other prominent object, observed from aeroplane or balloon, would suffice to determine the true course being made good in the one case, or the drift in the other. In ordinary coastal navigation the tables place a new power in the hands of the navigator, enabling him to gauge the effects of wind and current, when, as is often the case of a not too well lighted coast, only one light is in view. As a correspondent in the *Nautical Magazine* for the month of June, 1920, puts it:

The Edmonds Tables are one of the very few cases where the table does something for you that the chart won't—the ordinary angle on the bow tables are beaten by the chart in nine cases out of ten.

DISCUSSION

Amalgamation

(SEE PAGE 231, WHOLE NO. 216)

LIEUT. COMMANDER J. L. MCGUIGAN, U. S. Navy.—“The principle is well established that a homogeneous squadron of vessels can operate more efficiently than a heterogeneous one.” The principle being accepted as a maxim, the essayist concludes that it can be applied to personnel. The reasoning used is very deceptive. The principle stated is one applying only to material of a very specific nature. If the scope of the principle is enlarged by substituting “fleet” for “squadron,” the narrowness is at once apparent for it is common knowledge that dreadnoughts can operate more efficiently if accompanied by destroyers and air scouts than if not so accompanied. The principle as stated being of a very specific nature and not germane to the conclusion; the conclusion is of necessity wrong.

“The construction corps follows this same line up to a certain point. They have a common Naval Academy training, an early sea experience, and are sent ashore for special training. Here the homogeneity stops.” Many eminent authorities think that this homogeneity should stop before it does.

The following is quoted from an article in “Engineering” by S. V. Goodall, R. C. N. C. M. B. E., on “The Construction Corps of the U. S. Navy”:

“The advantages of this common course for midshipmen who are to become engineer, gunnery, torpedo, navigating, watch officers or naval constructors, are that for the first four years of their service all these officers are subject to the same strict discipline and learn that, whatever branch they may serve in later, their work is for the general good of the navy. As a result, they all have a similar outlook, and later in life there exists between the various branches a feeling of fellowship making for cooperation and smooth working. Actual service afloat during the period of training is a very valuable experience for the future naval constructor. The disadvantages appear to the author to be that the future executive officer gives an unnecessarily large amount of his time to the study of naval construction and allied subjects, while the future naval constructor gives too much of his time to matters which, although of interest, are not essential in the practice of his profession. As the average age at entry is 17 to 18 years, specialization is deferred to an unduly late period. While it may be claimed that this results in the possession of a broader outlook, such an advantage is dearly purchased at the cost of lack of intimate

knowledge. In a course covering so many subjects, it is inevitable that the knowledge obtained of many subjects is a mere smattering. This is particularly so in the case of practical instruction in the workshops. The authorities do not claim that they attempt to produce a skilled mechanic, but it is doubtful whether the time given is sufficient to enable a graduate to have that knowledge which, in the case of a naval constructor, is essential for the efficient performance of duties which are bound to devolve upon him during his service career. Moreover, in obtaining this limited knowledge of practical work in the workshops of an academy instead of those of a dockyard or such-like establishment, he loses the opportunity of making that intimate acquaintance with workmen which is invaluable to him later."

The naval constructors of the British Navy are given no sea training. British naval constructors start their training at the age of 14 and finish their studies at 22 or 23, the age at which our constructors start their specialization. There have appeared in English periodicals quotations from prominent British naval constructors stating that they were considering the possible adoption of some of the features that we use in the training of our construction corps officers. The advisability of sending older officers to sea as first lieutenants is not even hinted at.

The percentage of civilian naval architects who go to sea for periods of sea training is so small that it is negligible and the percentage is yet smaller of those who have had as much training at sea as the officers of the construction corps.

The essayist remarks that "They . . . do not remain in active touch with seagoing conditions, and inevitably drift away from the common general interest, towards a special or corps interest. They nominally pursue their specialty ashore, but actually, only a very small per cent of them are engaged in duties which fully utilize their special training, most of them being employed in general hull division work at navy yards and inspection duty."

Consider the detail of officers of the construction corps down to including the Naval Academy class of 1914, as of January 1, 1921:

- 15—Navy Department.
- 42—Navy yards.
- 12—Superintending constructors
and inspectors.
- 2—Sea.
- 5—Special duty.

It is hard to conceive how the present scant supply of officers of the construction corps could be shifted in their duties so that their specialized training could be more fully utilized. In the past, requests for detail of officers to the War College as student officers and to the Naval Academy as instructors have not been filled for lack of officers. The advantages that would be derived from these assignments would far outweigh any possible advantages due to assignments as first lieutenants of battleships.

A great part of the work of the construction corps is taken up with the study of the failures of material, which for the designer and repair man is the very best training possible. The first lieutenant of a ship comes into contact only with the failures of that ship; the repairer on shore comes into contact with the failures of many ships.

The idea is conveyed that general hull division work at navy yards, or inspection duty is not what a naval constructor is specially trained for. The essayist is evidently misinformed as to the training that a naval constructor receives.

The essayist remarks irrelevantly, "There is nothing in the world that takes the place of practical sea experience." It might be questioned "takes the place of practical sea experience" for what? "Vain-glorious men are the scorn of wise men, the admiration of fools; the idol of parasites, and the slaves of their own vanity."

It is emphasized that officers of the construction corps are handicapped because they do not go to sea. Are they handicapped as designers, as inspectors, or as navy yard operators?

The function of operating is often confused with design. There is such a marked difference in the psychological requirements of attention, retention, association, perception, memory, imagination, instinct and reasoning in a designer and an operator, which is illustrated by women chauffeurs who are very attentive and instinctive and who are good chauffeurs, but who lack the other qualities mentioned and who would be total losses as designers.

Consider the case of the average officer of the construction corps. As an average he graduates at 22 years, plus one year at sea and three years at postgraduate work, which puts him at the age of 26 when he completes his postgraduate work. Usually he is sent to a navy yard for a period of about four years. The work of the yard is roughly divided into: Inside, shop, and outside. The policies of training vary, but in general he is given something like one-third of the four years in each branch so that he can become familiar with office procedures, naval practices ashore, industrial supply problems, drafting procedures, docking, repair work, shop practices, management, plant equipment, etc. While productive work is done, a great deal of time is spent in education and in general it may be said that the major part of his time up to the age of 30 has been spent in education. At this period he particularly lacks design experience and knowledge of shop practices. The logical thing to do is to send him to the Bureau of Construction and Repair, assistant to a superintending constructor, or to another navy yard, and this is what is usually done. After this four years of duty he is then of some worth ashore and to detail him as a first lieutenant aboard a battleship would only serve to give that battleship a poor first lieutenant and deprive some shore establishment of a valuable man. How would submarines, destroyers, etc., fare in the assignment of officers of the construction corps to sea duty as first lieutenants?

The propelling machinery of our latest ships and a great deal of the electrical and ordnance work is not designed by our seagoing specialists.

We are fortunate in having many specialists in our industrial plants, who, while they do not take regular tours at sea, can appreciate the value of their specialty and apply it to our naval problems, producing such results as the electric drive. In the design of hulls we have no civilian specialists to turn to for aid and so if we wish to keep ahead or even abreast of the other navies of the world we must depend on our construction corps.

It might be of interest for the essayist to know that preparing rollers and aligning roller paths is usually considered as difficult and exacting a job as "aligning engines and pumps. . . ."

The writer agrees with the essayist that sea duty for officers of the construction corps would have a beneficial effect. This sea duty should be confined to special duty (such as target practices) and to staff duty. It is not believed that sea duty as first lieutenants would eliminate any of the "so-called friction" nor by such details would designs be bettered or navy yards improved.

Leadership

(SEE PAGE 323, WHOLE NO. 217)

AND

The Soul of the Service

(SEE PAGE 351, WHOLE NO. 217)

REAR ADMIRAL H. O. STICKNEY, U. S. Navy.—Captain Jessop's article touches a phase of service need second to none in importance at the present time. The great expansion of commissioned personnel has made it inevitable that but a small proportion of it can now be considered well grounded in the rudiments of the profession, or experienced in the art of handling men—whether subordinate officers or enlisted men. There are, unfortunately, many who fail to realize that officers require "handling" as well as does the man before the mast. Given an unhappy officer personnel, it is unnecessary to seek further for the cause of inefficiency. As Jessop well says: "The efficiency of the navy must always rest on the attitude of mind of the commissioned personnel" to an extraordinary degree.

I would not stress, however, the occasional changes in methods of teaching discipline at the Naval Academy. My impressions of that institution, gained during undergraduate days, and six subsequent years while there at the other end of the pencil, convinced me that if the service lived up to the splendid traditions inculcated at Annapolis, we should have little to fear in the crucial test of battle. Occasional changes in method are like breeding in new blood; not a bad idea. Only, it is an evil example that Annapolis cannot, for lack of time, teach thoroughness.

Owing to the great scarcity of older officers the young graduate is thrust upon his own resources at the moment when his diploma is, likewise (in some cases), thrust upon him. Need exists to-day to revert as soon as it becomes possible to the old time custom of making the new officer serve as junior officer of the watch and junior division officer. By all means, let

our aim be to make the first one or two years after graduation periods of real practical instruction—with thoroughness the keynote. But let us see to it that young and old alike are freed from hidebound adherence to the professional opinions of their seniors, which still is too much in favor. I know of one case where the gunnery officer of a ship "got in bad" with I can't say how many seniors simply because he complained in a routine report that certain instructions for drills were faulty; and he only escaped by a hair's breath being disciplined. We must distinguish far better than this between real breaches of discipline and professional criticism. The latter should be encouraged; if the criticism is unintelligent it doesn't harm the object—why, in the name of common sense, try to discipline or "squench" the critic? If we discourage it we shackle the brains of the service until they finally come to enjoy being dormant.

It would be economy to put ships out of commission, if need be, to obtain enough experienced officers to *teach* the young idea—both at Annapolis and during the short period of instruction to follow.

We can not hope to return to a normal state of affairs for several years, but our aim should be ultimately to devote one post graduate year, possibly two, to intensive practical instruction—not like the old "two years cruise" with its haphazard methods—but a period of real practical work carried out methodically, with an examination which will affect class standing at the end of it. There was mighty little instruction during the "two years cruise." There was but one good reason for abolishing that cruise—*viz.*: it had become impracticable to carry out the object of it—*i. e.*, instruction—because of scarcity of officers. If this scarcity can ever be overcome, why not go back to it?

The writer of "The Soul of the Service" probably had exceptional opportunities on his cruise. His experience sounds good to me.

We are prone to pat ourselves on the back and think we are "good enough"—or maybe we believe we are better than the other fellow. Stop, and think! How many times have you not seen mistakes made in maneuvers, or on the game board, that would have spelled defeat in battle? But you yourself might have done worse.

And remember that we were not put to the test in the Great War.

Who can study the reports of the Battle of Jutland without seeing the lost opportunities that must have caused bitter tears—shed in private perhaps, but none the less bitter? Would we have done any better? Who was to blame? No single individual was to blame, nor two, nor twenty. And it was fault of preparation as well as execution.

It should make each one of us give anxious thought—and realize more fully how stupendous is the problem that leads up to but one real solution—the battle.

The preliminary teaching at Annapolis, the fostering of many fine qualities of character, persistent practice of the best methods—experimentation—thoroughness—all this it is important for us to dedicate ourselves to anew if we would count ourselves the best.

I have reserved for the postscript, so to speak, a few remarks on that splendid paper "Leadership." You can not read it without feeling that it contains the ABC of success. Practice and apply the rules so aptly phrased by Commander Parker to the conditions touched upon by Captain Jessop, and there shall result such an increase in the efficiency of our navy as has never yet been seen. Yes, we know the rules, but we too often fail to apply them.

U. S. NAVAL INSTITUTE
SECRETARY'S NOTES

Membership Life, regular and associate, 5436. New members, 102. Resignations, 7. Dropped, 3. Deaths 5:

Rear Admiral F. H. Bailey, U. S. N.

Captain W. E. Lewis, U. S. N. R. F.

Lieutenant Frank McGlothlen, U. S. N.

Mr. J. J. McCook.

Mr. J. C. Drake.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a large monthly loss. The cost, per member, however, decreases with an increase in membership.

Dues The annual dues (\$3.00) for the year 1921 are now payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussions Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page.

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Book Department *The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid.* The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

The Boat Book, 1920, and the Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is 50 cents per copy, and of the latter, \$1.00 per copy.

In the early part of the summer, the Institute will publish three books, bearing the following titles: "The Aircraft Hand Book," by Lieut. Albert Tucker (C. C.), U. S. Navy; "How to Preserve Your Boiler," by Capt. E. P. Jessop, U. S. Navy, and "Composition for Naval Officers," by Professors Stevens and Alden, Dept. of English, U. S. Naval Academy.

The prices of these books will be announced later.

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Reprints of Articles The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have

opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147 and
Notice 173 of the PROCEEDINGS are exhausted ; there are so many
 calls for single copies of these numbers that the Institute
 offers to pay for copies thereof returned in good condition at the
 rate of 75 cents per copy.

ANNAPOLIS, MD., April, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO.....	I
PUBLICATIONS, U. S. NAVAL INSTITUTE.....	(2)
SPECIAL NOTICE	822
TOPICS FOR ESSAYS	823

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.	}	France	741
NAVAL POLICY.		Great Britain	746
MATÉRIEL.		Japan	750
MERCHANT MARINE.		United States	751
AERONAUTICS			763
ENGINEERING			775
ORDNANCE			780
RADIO			782
MISCELLANEOUS			785
CURRENT NAVAL AND PROFESSIONAL PAPERS.....			791

FRANCE

THE FRENCH NAVAL PROBLEM.—To those matter-of-fact Frenchmen who are concerned solely with results and efficiency, the recent debate on the Budget de la Marine, despite its many good points, cannot be said to give complete satisfaction. No doubt it proved the means of showing to the world that France, in the midst of her tremendous financial difficulties resulting from Boche aggression, does not entertain any thought of relinquishing her traditional rôle on the sea, and that she intends, by and by, to forge her way anew to the fore, as commanded by her vital interests. Whilst Germany and other Continental Powers may see in maritime power a road to conquest, France must be at all times in a position to maintain safe communications with her colonial empire, under penalty of losing in a few months the fruit of centuries of work and sacrifices, and of putting her very national existence in jeopardy. Side by side with aggressive Germania, that will continue to be a source of deadly peril—a nation of under 40,000,000 threatened by one of over 60,000,000—the colonies of France constitute her principal asset of superiority. Her hope is the sea, over which she pictures hundreds of thousands of reinforcements coming to her rescue in the hour of need, together with inexhaustible material help and supplies. This is a novel view of the French naval problem, to which ex-Minister Sandry called the attention of the Chamber; without her colonies France is powerless to successfully wage war on the Continent. Thus her situation, under the new conditions of warfare, has come to resemble partly that of England, and the acknowledgment of this fait nouveau by the Chamber is gratifying to French believers in sea power.

But where the "discussion du Budget de la Marine" has proved rather disappointing to naval observers is in the apparently hopeless divergence of the views that were expressed as to the new conditions of sea warfare and as to the maritime needs of France. Apart from the worthless opinions thrust into the debate by grossly-ignorant députés such as the Bolshevik member Goude, who exclaimed, "Aucun cuirassé anglais n'a pu prendre la mer sans être torpille" (no English battleship was able to put to sea without being torpedoed)—a ridiculous assertion promptly refuted by Le Cour

Grandmaison, it is obvious that those orators who, like Minister Guisthau, Admiral Guépratte, Le Cour Grandmaison, de Chappedelaine, and Dupuy, spoke with competence and authority, fail to view the naval problem of to-morrow in quite the same light; and what is written and said outside of Parliament confirms the fact that, although two and a half years have elapsed since the cessation of armed hostilities, French naval students are still unable to see eye to eye as to the true meaning of the lessons of the war. The section Historique, of which so much was expected, has, for the lack of a military brain at the head, been nothing more up to the present than an academy of pleasant and scholarly verbiage and literature, without any influence on the opinion of the leading circles of the service, and there prevails in the renovated Conseil Supérieur that same interesting variety of views that led to such animated "séances" within the last few years, and that have heretofore prevented a satisfactory and final programme being adopted and placed in hand. In truth, there are symptoms of similar uncertainty in the counsels of the British and American Admiralties, with this difference, however, that the London and Washington naval authorities are "up and doing," and obtaining substantial results, whereas the Rue Royale can only show good intentions and fine projects as its *raison d'être* within the last three years—though some startling change may shortly take place in the French naval stagnation, if the energetic Minister Guisthau has his own way.

Yet there can be no all-round efficiency, no rational investment of the maritime budget without an official naval doctrine, that is without a consensus of opinion among naval men as to the characters of the contests of to-morrow and as to the special needs of France. In other terms, those responsible for the shipbuilding policy and for the preparation for war must ever have present in their minds, as a guiding star, the aims underlying the naval armaments of their country, and, as noted by Admiral Darrieus, "cet objectif doit être concret," namely, the naval policy must supply the direct antidote to the main dangers likely to arise from the oft-changing international situation. French naval men have long envied the *esprit de suite* and continuity of efforts that marked the building up of the supreme British Navy, in striking contrast to the successive crazes and spasmodic efforts that brought about the ups and downs of the Marine Républicaine, and have caused such a waste of expenditure and talent—for up to the war no navy could compare for inventive genius with the French, that had done pioneer work in every branch, though since then the palm of invention has passed to the British side. Superior constructional merit, even superior finances are apt to become wasted assets without a well-defined and stable naval object towards which all thoughts and efforts must perseveringly strive; the parallel development of the French and German navies from 1900 to 1914 offers a convincing illustration of this truth. With a much smaller expenditure, with inferior human resources, but with unity and stability in the direction, von Tirpitz managed in 15 years to create a war fleet outwardly very much superior to the French. Again, the only period within the last 50 years when the Republican marine could be said to be making headway and regaining the ground formerly lost is from 1910 to 1914, when the Lapeyrère naval programme embodied the "Doctrine Navale" preached by Admls. Daveluy and Darrieus, was accepted by the bulk of naval men, and faithfully and vigorously carried out by the successive Ministers Lapeyrère, Delcassé, and Baudin. Then French yards came up very nearly to British standards of construction, excelled German competitors, and slowly but surely France was forging her path to her traditional rank. The drawback of that pre-war Doctrine Navale was that it was too narrow in its scope, fleet action being deemed the all-in-all of sea warfare. Yet its marvellous influence on the efficiency of the Gallic Fleet is undeniable.

To-day a novel, up-to-date, and broad-minded Doctrine Navale is the urgent need of the moment. Our eminent constructors need it to guide

their "recherches" and experiments, and our go-ahead officers de vaisseau to efficiently train their crews for the real thing. The very composition of the British fleets—so very different from pre-war conditions—and what is known of the tactical exercises on totally novel lines recently conducted by war-tried English squadron commanders have convinced French naval observers of the tremendous lead the British naval authorities have gradually and silently acquired on the most vital point in sea affairs, viz., they have made up their minds and have found their way, whereas the French are seeking theirs, being in the meantime condemned to inertia and stagnation. The inferior croiseurs légers and destroyers of the 1918-19 programme, that would have suited a minor navy, showed the absence of clear views, and also of true efficiency, in high quarters. To slavishly copy others has always been a sign of decline and mediocrity in any navy. It has always been a rule for navies with strong vitality within to boldly strike forward on ways of their own: vide, the British Navy under Lord Fisher, the French Marine just before the 1870 war and under Admiral Aube; and now the American Navy. And progress of this sort, of course, requires two conditions, viz., the existence of a naval doctrine together with strong will at the head.

The recent exchange of views between Parliamentary experts gives the impression that, under the outward conflict of persons and ideas, a new French naval doctrine is in the making. Even the partisans of an efficient battle fleet let it be implicitly understood that the revolution accomplished in the conditions of sea warfare and the possibility of the narrow European seas being controlled by aerial and submarine flotillas have modified in toto the French naval problem, and would enable France to defend her coasts and eventually act offensively against her neighbors, without the need of a superior battle force. Hence the unanimous request in favor of strong seaplane and submarine flotillas that are to compose our "première ligne de défense" on the water, and the little enthusiasm evinced for the completion of the half-completed *Normandies*, the fate of which cannot yet be considered to be finally settled.

At the same time, all experts of influence are agreed France must continue to keep the premier Continental battle force in the Mediterranean as a safeguard for her African possessions and an insurance against international friction. Bizerta, Oran, and Dakar are to be held strongly, and cross-Mediterranean aerial service developed at all costs.

As to the characteristics of the French capital ship of to-morrow, great divergence of views prevails. Admiral Guépratte favors battle cruisers. Speed and calibre, he claims, are the essential factors of victory. Apparently he advocates 7.6-inch weapons for light cruisers, and 18-inch guns for battle cruisers, which means extreme displacements. It is only right to say that leading constructors hold that, if the "cuirassé de demain" is to be, it will be a heavily-armored and practically unsinkable mastodon. Interesting designs are known to have been prepared in this direction. On the other hand, Mons. Dupuy, President of the Marine Committee, prophesies the construction de "petits dreadnoughts de 15,000 tonnes!" Admiral Bienaimé, whom the war has confirmed in his admiration of the battleship, "roi des mers," wants more and more armament and protection. The relative weight of broadside remains the true criterion of worth in his opinion.—*The Naval and Military Record*, March 16, 1921.

THE FRENCH FLEET IN 1921.—The pre-war naval situation has been completely changed as the twofold result of the victory of the Allies and of aerial and submarine developments, although Great Britain still retains the first place, if not on paper, at any rate in reality, when is considered the efficiency of her striking force immediately available for action against all comers, together with the unique advantage that is derived from the well-equipped British points d'appui to be found in every ocean. For if the war has shown anything, it is the determining value of range and mobility, and

consequently of well-appointed strategic bases. Even without a battle fleet, and merely by virtue of fast cruisers and adequate aerial and torpedo flotillas distributed in her oversea strongholds along the commercial sea routes of the world, England could at will do away with the safe communications of any other Power. In this respect she has benefited by the recent revolution in the conditions of warfare more than any other navy, though France comes next to Great Britain in the matter of strategic assets, and it is this *fait nouveau* that renders even the diminished French Navy of to-day of far greater weight in the balance than appears on the surface. United together, Britain and France can control every sea, Bizerta completing Malta and Gibraltar, Dakar filling the gap between Gibraltar and Cape Town, and the splendid roadstead of Diégo-Suarez (Madagascar) making up for the deficiencies of Mauritius harbors, whilst Tahiti Island, in the Mid-Pacific, together with Nouméa, has a strategic future.

The relative value of the French Navy is measured not only by the number of heavy guns it can array, but also and chiefly by the radius of action and offensive capabilities of its ports militaires and colonial points d'appui. It is the realization of this truth that has led to the recent change in the methods of the Paris Admiralty that prefer "*une flotte réduite comme nombre, mais vivante et constamment prête au combat*" to a large paper fleet, half-manned and half-trained, such as it was under the administration of the good-intentioned Ministers Leygues and Landry. Our latest Minister of Marine, the able M. Guisthau, is anxious to have in commission, and with full complements on board, only really warworthy units. Unfortunately with the extremely rapid changes now taking place in naval architecture, it is not so easy to decide as to the degree of efficiency of a given class of dreadnoughts, especially as the war performances of relatively weakly-gunned German ships at Jutland somewhat served to confuse the ideas of naval students—though the judicious remark is being made here that, had British 13.5-inch guns fought the war with their present shells, Jutland results would have been very different, and England would have reaped the full benefit of her superior calibres.

Therefore, with the experimental tests of projectiles now being made by all great navies, it would be a mistake to take it for granted that in future contests superior quality of shells might be able to make up for any inferiority in calibre. Also, the eminent ingénieur Laubeuf and most of our artillery experts agree in considering 12-inch-gunned dreadnoughts as being unfit for the first line of battle, both by reason of their obsolete armament and of their insufficient protection, with the consequence that the French Navy only possesses three "*cuirassés de premier rang*," viz., *Bretagne*, *Lorraine*, and *Provence*, and Italy none. Admiral Bienaimé is not quite so exacting in his estimate of battleship worth, and believes the 12-inch gun will have a say for some time to come, up to the advent of super-15-inch weapons. The American Navy he classes first (on paper) with a total broadside of 246,000 kilogr.; then come Great Britain, with 221,000 kilos; Japan, with 201,000 kilos; France, with 35,000 kilos; and, lastly, Italy, with 24,600 kilos. Truly, tremendous is the come down of France, which was estimated in 1914, reckoning the five *Normandies*, to be superior to both the United States and Japan. If broadside weight measures sea power, the war has crippled the French Navy, indeed. Still, as urged by Admiral Guépratte, no hard and fast rule ought to guide France in the discarding of her older ships; her needs are not those of Great Britain. The latter is perfectly right in discarding 12-inch dreadnoughts; every advance in the standard of fighting units is to the advantage of the richer or superior power, and for ocean work there is no doubt about the 12-inch being obsolete. In the Mediterranean, however, where Italy maintains in commission remarkably-armed but rather poorly-protected battleships, the four 18,000-ton *Voltaires* represent for a few years to come a substantial fighting value which it would be unwise to throw away "*pour suivre une mode étrangère*."

Minister Guisthau's plan d'armement modifies completely the composition of the fleet, such as it had been established by his predecessor, and the change will benefit considerably the fighting power of the Flotte Française that will see, in the current year, every battle-worthy unit in full commission, on a war footing, and placed under the best conditions for efficient training. Instead of being half-manned, or in the reserve, the seven 24,000-ton *Bretagne*, *Provence*, *Lorraine*, *France*, *Courbet*, *Jean Bart*, and *Paris* are to be completely manned all the year round, with permanent officers and crews on board, undergoing the same training in gunnery, anti-torpedo, and anti-aerial exercises, though, for a few months to come, they will unavoidably be separated, the *Provence* being flagship in the Levant, with the six-funnelled croiseurs cuirassés *Guinet*, *Rousseau*, and *Renan*; the *Lorraine* and *Bretagne* to be in dockyard hands for modernizing purposes, the *Courbet* to be "Ecole de Canonage," the *Paris*, *France*, and *Jean Bart* composing the division d'entraînement, together with the 12 refitted 800-ton destroyers of French construction, *Casque*, *Mehl*, *Bisson*, *Bouclier*, *Roux*, *Mangini*, *Magon*, *Cémeterre*, *Bory*, *Lucas*, *Protet*, and *Garnier*, a few avisos porte-avions, and a submarine flotilla.

There will be, moreover, in Levant, the 28-knot and 5000-ton *Strasbourg* (ex-German), shortly to be ready, 8 avisos or canonnières, together with the 12 Japanese-built destroyers of the *Algerien* class of 700 tons. Adding substantially to French power in the Middle Sea, there will be the gradually growing aerial, torpedo, and mining flotillas of Toulon, Bizerta, Corsica, Oran. At present based in the Tunisian stronghold there are 8 destroyers of the *Lansquenet* class and a dozen submarines of 500 to 600 tons, without mentioning gunboats and small auxiliaries.

The *Tricolour* is to be more worthily represented in the Atlantic. The obsolete 10,000-ton *Marseillaise*, that is to share the fate of her sister-ship, *Amiral Aube*, just condemned, will shortly be replaced by the faster and stronger *Michelet*, of 12,570 tons and 23 knots, that proved the most reliable of our croiseurs cuirassés in the course of the war, mainly owing to the fact that she is fitted with excellent small-tube boilers. The *Michelet* is, of course, out of date, and would fall an easy prey to any battle cruiser. She may be compared with the ill-fated armored cruisers of von Spee. Yet she is a well-designed, robust roomy ship, and imposing enough to show the flag with dignity. For at least two years to come there will be no cruisers in the American Navy quite capable of catching her; and, on the other hand, she could more than hold her own against such opponents as the fine and more up-to-date British *Raleighs*. These are considerations that justify the decision of Minister Guisthau. The Division volante de l'Atlantique is to further include the 10,000-ton croiseur cuirassé *Gueydon*, the 29-knot *Mets* (ex-German), and the 1200-ton gunboats *Antarès*, *Régulus*, *Cassiopee*, and *Ville d'ys*. This heterogeneous collection of ships is merely intended to show the flag and to do police work on the West African coast and on the Newfoundland and Iceland fishing grounds. In the Far East the 10,000-ton *Montcalm* will continue to act as flagship of Rear-Admiral Thomine, whilst the 1200-ton *Bellatrix* will have Madagascar as headquarters. On the whole, France is seen to be poorly represented in distant waters. No wonder it is the intention of Minister Guisthau to add to the prestige of the *Tricolour* by sending dreadnought divisions on distant cruises. Many are of opinion that the 18,000-ton *Voltaires*, that are excellent ships in their way, ought to be commissioned in place of the make-believe croiseurs cuirassés of 10,000, 12,600, and 14,000 tons, most of which have lost much of their speed, and which are extremely costly in upkeep. And as words are everything in France, since the 17-knot *Gueydon* and the 14-knot *Cassard* are deemed to be croiseurs, the 20-knot *Voltaires* have every right to be baptized croiseurs de bataille. At least they would not, like the *Renan* *Ernest*, or *Michelets*, be at the mercy of a single torpedo or big shell.

With stable crews on board, improved armament and protection, the seven 24,000-ton French dreadnoughts will make up "la flotte la plus formidable de la Méditerranée occidentale," as advocated in the Chamber, at least so far as gun-power is concerned. Unfortunately, guns nowadays are not everything, and should war ever break out in the Middle Sea, the main say will belong to aerial and torpedo flotillas, and much would depend on the offensive capabilities of the *Provence*, *Corsica*, and *Tunisia* aerial and submarine bases.—*The Naval and Military Record*, Mch. 23, 1921.

GREAT BRITAIN

LORD LEE ON NAVAL POLICY.—The speech delivered by Lord Lee, First Lord of the Admiralty, at the annual dinner of the Institution of Naval Architects, was the shrewdest and most statesmanlike utterance on naval policy which has been heard for many a long day. Among the various questions it brought under review the most important were the Admiralty's decision as to new construction, and the keen desire of his Majesty's Government to work hand in hand with the United States in safeguarding the freedom of the seas. As to the first, there can no longer be any doubt that the balance of naval opinion is heavily on the side of the big ship. Only one flag officer who served afloat in the late war is to be found in the ranks of the "antis." The navy as a whole considers the battleship to be an essential unit of the fleet, and, in view of this virtual unanimity of professional opinion, there is no escape from the obligation of laying down new vessels. Lord Lee's argument, that if we must rest content with a smaller navy, it is more than ever imperative that the navy should be of the very highest quality in regard to its material as well as to its personnel, is unanswerable. To proceed on any other assumption would, as he reminds us, imperil that most precious possession—the moral and spirit of the British Navy. That a convincing case for the big ship must have been made out is obvious, but it is to be hoped that a digest of the evidence, not necessarily the technical details, on which the verdict is based will soon be made public. We notice that the anti-battleship spokesmen are becoming more violent and illogical as the failure of their propaganda manifests itself. Sir Percy Scott would have us believe that the sea lords who have advised in favor of battleship construction are either fools or knaves, for it would be sheer knavery to let the country in for such heavy expenditure were it known to be unnecessary. But the public is really not interested in Sir Percy's private feuds with the Admiralty. It believes that officers who held high commands at sea throughout the war are in a better position than armchair critics to determine the future needs of the navy; and it does not forget that Sir Percy's forecast in 1914 of what the submarine would do against the battleship was completely refuted by war experience.

A One-Power Standard.—It is quite true, as Lord Lee told his hearers, that this country has never accepted in the past a claim to equality at sea put forward by any other power. We refused to treat with Germany on any such basis, and rightly held it to be a maximum concession when we agreed to the 16—10 ratio of strength. The fact that our government has twice affirmed in the most formal way its acceptance for the future of a one-power standard is convincing proof of its desire to avoid a naval competition with the United States. This desire is shared by the entire British people, and we believe that it is reciprocated by the bulk of the American people. Too much should not be made of the "raging, tearing propaganda" which is persistently carried on by disgruntled hyphenates of German and Irish origin. At the same time Lord Lee demurs to the view that this Anglo-American naval position should not be discussed because war with America is "unthinkable." The subject, as he says, is one about which we should be thinking night and day, with the fixed intention of making it impossible. To the American Government he conveyed a broad hint of his readiness to discuss, at Washington if need be, the preliminaries to a

mutual agreement which would rule out any chance of shipbuilding rivalry now or in the future. We earnestly hope that a conference with this object in view can be arranged, and that at an early date. In this country all parties and all classes would support the government in taking such steps as may be feasible to protect our interests and at the same time to banish once and for all the possibility of an insane and fratricidal conflict.

Nation and Navy.—Last week's debate on the navy estimates quite disposed of the legend that the country, impoverished as it is, would shrink from the cost of keeping up an adequate navy. The strongest criticism of the Admiralty program was not that it went too far, but that it did not go far enough. In no quarter was any tendency displayed to refuse the navy the means of keeping efficient and ready. The impression received by many who followed the debate was that the Admiralty would have got more had they asked for it. Both Col. Archer-Shee and Sir F. Banbury were cheered when they urged the government not to let the navy sink to second place under any circumstances. The House of Commons, at all events, is as sound on the naval question as ever it was, and doubtless the country at large is at one with Parliament in insisting on nothing less than equality. Only a few weeks since it was predicted that something like a popular revolt would ensue if the Admiralty dared to ask for more battleships. Those who talked in this way forgot the unique place which the navy holds in the mind of the British people. Even in times of acutest financial stress the initiative in cutting down the navy has never come from the people, but always from the politicians, and it has often seemed as though the public had a clearer perception of history than those who guide its political destinies. Sir E. Carson was probably right when he declared that if the country heard the navy was going to be inferior to that of any other power there would be a widespread agitation to reverse this policy. Sooner or later air power may supersede sea power, but until that happens the British people will never consent to be ousted from the element which instinct, no less than history, teaches them to be the true source of their national safety and prosperity—*The Naval and Military Record*, Mch. 23, 1921.

THE BIG SHIP SURVIVES.—Those who have followed the discussion upon the capital ship and the respective arguments advanced in the controversy will hardly be surprised at the official intimation that the big ship, surviving the attacks made upon it, is recognized as the essential unit of the fleets of the immediate future. This is not to say, of course, that those who support the theory that its position has been rendered untenable by the advance in submarines and aircraft have not some ground for the views they put forward. It is now evident that in estimating the experiences and influence of the war they have looked for a much greater advance in the air and under water than has actually taken place. The fundamental point at issue, after all, is the battle between the gun and the torpedo, and however much there may be improvements in the various torpedo carriers, these are of relatively small account unless there is equal advance in the torpedo itself. And so far the torpedo remains, if not unreliable, at all events uncertain and erratic as compared with the gun.

The automobile torpedo, such as carried by the submarine, and the aerial torpedo or bomb, are both missiles which belong to the same species, and in each case their method of discharge does not yet admit of the precision and long range which is characteristic of the gun. It is easy to imagine the difficulty there is in judging the exact course and speed of the target, to begin with, and then, assuming these to have been obtained correctly, the vital importance of accuracy in marksmanship. But even given this, a very little disturbance indeed is required to deflect the course of the automobile torpedo, as was shown over and over again in the war, when, for example, submarines got sitting shots at surface craft and yet were unable to hit them. Similarly, the static torpedo or mine cannot now be relied on so much as formerly to fulfil its object owing to the advent of such

devices as the paravane. It may be recalled that when the enemy submarines during the war were attacking merchant ships they found the use of the torpedo was most wasteful and that it was necessary to supplement it. While the merchantman was unarmed they could use bombs, but when the former carried a gun the limitations of the submarine as a gun carrier were at once apparent, for one hit even was sufficient to deprive her of her essential quality, the power of submersion. When the depth charge came into use the vulnerability of the submarine was more apparent still. In short, towards the end of the war, and since, it has been the anti-submarine devices which have made headway.

Turning to the menace to the big ship from the air, it is often forgotten that this can be countered just as that from under water has been. Mention has been made of the difficulty of accurate aiming with torpedoes. Fired from aircraft, this difficulty is intensified, and when the aircraft is itself attacked, as it would be in most cases, the odds against it are obvious. Not only so, but it must come down to a very low altitude to discharge its torpedo, which otherwise would be liable to break up on impact with the water, and the shorter the range the better chance of the big ship defending herself with her anti-aircraft guns. On the other hand, the value of the bomb when used against the upper works of a ship has yet to be demonstrated. The sort of experiment which considers that a great advance has been made when a good proportion of bombs have been dropped into a given space resembling that of a ship's deck is useless. The airman in such a test is not fired at, his target is not moving, and there is no means of estimating the damage a hit would cause on a protected vessel, on which there must be several places where a bomb could strike and do no real harm. What the distant future may hold in store no one can predict with confidence, but the signs of to-day are that there is no likelihood of the new big ships being rendered obsolete within the next five years, except in the sense, of course, in which every new ship begins to get obsolete from the moment she is laid down.—*The Army and Navy Gazette*, Mch. 19, 1921.

ADMIRAL BAYLY'S MESSAGE.—That the proposal which Admiral Sir Lewis Bayly has brought from across the Atlantic, to the effect that British and American naval officers and men who served together during the Great War should wear a common medal ribbon in commemoration thereof, would meet with cordial approval in our own sea service was a foregone conclusion. The close camaraderie born of a partnership of peril should surely be a lasting one, and anything calculated to further this end must warmly commend itself to all right-thinking men.

A further suggestion in the same direction is put forward, and seems to us to merit sympathetic affection. It is that a United States cruiser and destroyer flotilla should be attached to our Atlantic fleet for the summer cruising season. To carry the fullest possible effect such an arrangement should be reciprocal. An entente of this character between the two greatest navies in the world would be the finest guarantee of peace. The aims and ideals for which the two fleets stand are virtually identical. We have practically everything in common and nothing in conflict. Such a mutual affiliation would prove the best confirmation imaginable of the assurance that the present immense building programme of the United States is in no way directed against British maritime interests.

Reverting to the idea of a common commemorative medal, we have heard but one point of demur raised. A well-known naval officer, in discussing the subject, whilst frankly sympathetic towards it, expressed some apprehension lest it should form a precedent for a similar claim on the part of the navies of all the Allies. Such a development would, of course, quite neutralize the distinctive character of the symbol, which is one of the principal features of the proposal. The suggestion is a perfectly legitimate one, and will doubtless have occurred to many.

In a general way the Allies' medal meets the natural wish for an international decoration. But the association between the British and American navies was of a far closer and more intimate character than any other of the war partnerships, not forgetting our co-operation with the French in the Mediterranean. We had an American battle squadron incorporated in the Grand Fleet. We had American flotillas based upon British ports. We had an American Admiral acting as Commander-in-Chief at Queenstown. But beyond all this, there is another condition which deeply strengthens the appeal of Sir Lewis Bayly's proposal on both sides the Atlantic, and this is the kinsmanship of the two races. Sharing a common heredity, the sentiment of "blood being thicker than water" rests upon something very much more profound than mere diplomatic reciprocity.—*The Naval and Military Record*, Mch. 16, 1921.

BRITAIN'S GREAT SHIPPING CONCERNS.—The tendency already noticeable before the war for British shipping to concentrate in a few hands was further accentuated during the period of hostilities. At the present time, half a dozen great concerns control eight million gross tons of shipping or approximately one-half of Britain's total tonnage engaged in foreign trade. The first of these giant combines is the P. & O., headed by Lord Inchcape, which includes the following companies:

Company	No. of Ships	Gross Tons
British India Line	186	974,108
P. & O. Company	64	565,415
Federal Line	15	145,669
New Zealand Shipping Co.	18	167,571
Hain Steamship Com., Ltd.	49	230,746
Orient Line	8	94,812
Gen'l Steamship Nav. Co.	38	40,000
Total	378	2,218,321

Next in importance is the Royal Mail group, headed by Sir Owen Philipps, which possesses the following tonnage:

Company	No. of Ships	Gross Tons
Royal Mail Stm. Pkt. Co.	58	388,808
Elder, Dempster & Co.	98	431,537
Union Castle Line.	53	388,802
Lampart & Holt.	57	361,021
Pac. Steam Nav. Co.	43	262,025
H. & W. Nelson.	12	79,058
Total	321	1,911,251

Third place is held by the White Star group, controlled by the International Mercantile Marine Company, as next set forth:

Company	No. of Ships	Gross Tons
White Star Line.	25	354,353
Leyland Line	37	229,700
Shaw, Savill & Albion Co.	21	203,274
Atlantic Transport Line.	10	188,724
Dominion Lines	8	68,883
Aberdeen Line	7	79,000
International Nav. Co.	5	83,252
Total	122	1,207,186

The Cunard Line and its subsidiaries, comprising the following lines and tonnage, comes next:

Company	No. of Ships	Gross Tons
Cunard Line	34	427,493
Com'wealth & Dom. Line.....	29	224,066
Brocklebank Line	29	202,529
Anchor Line	19	165,712
Donaldson Line	22	138,478
Total	133	1,158,278

Fifth and sixth rank are held respectively by the Ellerman lines, with 215 ships of 953,335 gross tons, and the Furness-Withy combination with 185 vessels of 866,272 gross tons.—*The Nautical Gazette*, Mch. 19, 1921.

JAPAN

FILIPINO FEARS OF THE JAPANESE.—Solving California's problem by diverting the stream of Japanese emigration to the Philippines is a very fine idea for the Californians, but what about the feelings of the Filipinos, who have as great a horror of the "Yellow Peril" as the most fastidious of Americans? This question agitates the vernacular press of the islands, we are advised by the Manila *Spotlight*, which says that the mere suggestion that Japanese immigrants should be turned toward the Philippines causes consternation in many Filipino circles. *La Revolucion*, a Cebu daily, points out that if America with all its power and wealth denies entry to the Japanese because it considers them a peril to the American nation—first "an economic peril" and then "a political peril"—"let the reader judge for himself what this immigration will mean for the Philippines in view of our small size and the state of incipency of our economic forces." This journal adds:

"All who have eyes and think with the serenity which the problems related to our life as a people merits see all this. Not that we entertain hatred or systematic prejudice against the Japanese people, as those who try to make us believe that Japan does not constitute a peril to our territory naturally would contend.

"The truth is that the facts, always a thousand times more eloquent than words, are what with overwhelming clearness indicate to us the existence of the peril, and they call strongly to the reasoning of men of good will for foresight and every sort of care for the future of our own soil."

If it is true that the United States is to forbid the entrance of the Japanese into the United States and Hawaii, but to allow them free access to the Philippines, remarks *La Nacion* (Manila), this would be a case of America and Japan settling a matter of fundamental moment to the Filipinos without consulting them and unquestionably would be "unjust." This newspaper does not pretend to guess what the Filipino people would do if the Japanese immigration question were submitted to them for a decision, but it is quite sure that they have a right to be heard in the matter, because—

"The free entry of Japanese into the Philippines will necessarily create interests, relations, ties, and will establish agreements and responsibilities which unquestionably will compromise the Filipinos. Consequently, if the question is decided without the participation of their wishes, in the case that the relations, agreements, responsibilities, and ties which would be established should be onerous to the Filipino people, the decision would have for us the concept of a tyrannical imposition.

"In case that the Japanese immigration question should be decided in the sense of giving unrestricted entry to the Japanese into the Philippines, the result will be that when America does give us independence, we will not be able to enjoy full independence, since we will be shackled by the agreements

and ties that would have been established and by the obligations we would contract by virtue of Japanese immigration."

But the *Manila Bulletin* charges that there has been "an unfortunate misinterpretation in certain sections of the vernacular press regarding the effects of immigration legislation at Washington. The bill did not mention the Philippines, and therefore is not applicable to them, and this journal points out—

"By the same token there is nothing about it that changes the situation in the islands a particle. Immigration of foreigners into the Philippines will be governed by statutes already on the books, and there need be no cause for alarm."—*The Literary Digest*, Mch. 26, 1921.

JAPANESE TONNAGE GROWS AT SUEZ.—Japanese tonnage comprised 9 per cent of the total tonnage passing through the Suez Canal in 1920. In this respect Japan occupied second place as compared with sixth place before the war, when her tonnage was only 1.7 per cent of the total movement recorded. The following table shows the growth in the amount of Japanese shipping using the Canal during the last ten years:

Year	Tons
1911	362,000
1912	319,000
1913	344,000
1914	334,000
1915	566,000
1916	70,000
1917	155,000
1918	502,000
1919	1,449,000
1920	1,602,000

—*The Nautical Gazette*, Mch. 12, 1921.

UNITED STATES

TO UNITE THE NAVY IN THE PACIFIC.—A considerable stir is being created in Washington over the question, under discussion at two Cabinet meetings, of putting the entire battle-ship fleet in Pacific waters, and many reasons for the plan are advanced by correspondents. The move is not definitely announced, but seems to be tentatively proposed to draw out the opinion of the country. Whether it would make the Pacific more or less pacific than it is now seems to be the nub of the question. The island of Yap, which Japan is holding in spite of American protests for equal cable rights, is set forth as the chief reason, and it is closely followed by the island of Saghalien, which was partly occupied last year by Japan against our protests. The deep feeling against the Japanese in California, Japan's reciprocal attitude because of the passage of the antialien land law by California, and the exposed position of the Philippine Islands are given as other reasons for reuniting the fleet in Pacific instead of Atlantic waters. "Sword-rattling," the *New York Evening World* calls the anti-Japanese talk that is circulating freely. And "it was by precisely such gestures that Wilhelm of Germany 'kept the peace of Europe' by rattling the sword," declares this paper.

Official Washington has as yet given no reason for the proposed change, but officials of the Navy Department are reported as saying that naval strategy demands that the fleet be concentrated, and they point to what England accomplished in the late war by observing this fundamental rule. In reality, asserts the *Boston Transcript*, recalling that former Secretary Daniels divided the fleet, "it is the first step toward un-Danielizing the navy." "It means the adoption of a strong naval policy in the Pacific," believes the *Detroit Free Press*, "and this course is necessary as a matter

of ordinary, enlightened self-interest." As W. W. Jermane writes in the *Seattle Times*:

"If such a policy should be adopted by the Harding Administration, it will have more of an economic than a political foundation. It will visibly express part of the most ambitious program any Administration has ever had for making sure that the United States has a fair share of New World markets. The Pacific offers potentially great markets for American manufactured goods, and America needs the Pacific's vast stores of raw materials.

"Prior to the war our fleet was in the Atlantic, for the bulk of our trade was there. If it is to be sent to the Pacific, under the plan the Cabinet has been considering, it will be in recognition of the fact that the war has shifted the world's trade-center, or that part of it in which we are most interested, from one ocean to the other."

On the other hand, says a Washington dispatch to the *New York Tribune*, "Japan is preparing to embark on an elaborate program of naval aviation," and already she has engaged British flying instructors and purchased French airplanes of different types. Also, say some editors, while England and France would welcome a cessation of war-ship construction, Japan proves a stumbling-block in the plans for disarmament. However, adds the *Tribune*:

"There is nothing aggressive, there is no threat of war against any nation, in this sensible policy of reuniting a disrupted fleet. It is a mere condemnation of the inexcusable action of the previous Administration in dividing the fleet in defiance of naval strategy.

"The world at large, as well as sensible people at home, will understand that the reorganization of our fighting fleet is nothing more than a return to naval sanity after years of naval incompetency and political chaos."

The Pacific coast view-point, as set forth in the *Oakland Tribune*, is that while the people of the Pacific coast "want adequate naval protection, they do not desire to see the Atlantic coast abandoned." This California paper is willing to leave the matter entirely to Secretary of the Navy Denby, who is "equipped intellectually to take a national view of national problems." We read on:

"A large-vised, permanent naval policy is now being considered by the government. It is a policy that comprehends the delicate and disturbing character of international politics in the Pacific area. It takes cognizance of the ambition of an oriental power to expand its influence and usurp control throughout the Pacific. It recognizes the covetous, militaristic, land-grabbing designs of this Asiatic power.

"The people of the Pacific coast want peace, and they know that a strong naval defense is the best protection against war. They are gratified that the government is conscious of its duty in this connection."—*The Literary Digest*, Apr. 2, 1921.

PANAMA CANAL TRAFFIC FIGURES.—The growth in the number of tons of cargo carried annually through the Panama Canal since its opening on August 15, 1914, is shown in the following table:

Year	Tons
1914	1,745,334
1915	4,894,134
1916	4,838,496
1917	7,427,680
1918	7,294,502
1919	7,468,167
1920	11,236,119

Of the cargo handled in 1920, 5,269,350 tons were carried from the Atlantic to the Pacific and 5,966,769 tons from the Pacific to the Atlantic. The greatest traffic was from the west coast of South America to the east coast of the United States. It amounted to 1,447,849 tons.

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,
AS REPORTED FEBRUARY 28, 1921

Type, number and name		Contractor	Per cent of completion			
			Apr. 1, 1921		Mar. 1, 1921	
			Total	On ship	Total	On ship
<i>Battleships</i>						
44	California	Mare Island Navy Yard.....	96.1	95.7	95.8	95.2
45	Colorado.....	New York S. B. Cpn.....	69.3	66.2	68.	65.
46	Maryland.....	Newport News S. B. & D. D. Co.	96.8	96.2	95.	94.3
47	Washington.....	New York S. B. Cpn.....	61.2	54.3	59.5	52.1
48	West Virginia.....	Newport News S. B. & D. D. Co.	49.5	39.3	47.	36.3
49	South Dakota.....	New York Navy Yard.....	26.7	18.1	26.	17.2
50	Indiana.....	New York Navy Yard.....	23.1	14.8	21.4	12.6
51	Montana.....	Mare Island Navy Yard.....	18.	11.9	17.5	10.7
52	North Carolina.....	Norfolk Navy Yard.....	27.4	19.8	24.1	16.1
53	Iowa.....	Newport News S. B. & D. D. Co.	16.1	12.6	14.1	10.5
54	Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	2.5	....	2.	....
<i>Battle Cruisers</i>						
1	Lexington	Beth. S. B. Cpn. (Fore River)..	13.8	4.	10.6	2.3
2	Constellation	Newport News S. B. & D. D. Co.	7.9	4.8	6.5	3.8
3	Saratoga	New York S. B. Cpn.....	18.1	9.5	16.	8.
4	Ranger.....	Newport News S. B. & D. D. Co.	1.2	.6	1.1	.5
5	Constitution.....	Philadelphia Navy Yard.....	4.3	2.	3.	1.2
6	United States	Philadelphia Navy Yard.....	4.3	2.	3.	1.2
<i>Scout Cruisers</i>						
4	Omaha.....	Todd D. D. & Const. Cpn.....	90.	81.8	88.4	80.7
5	Milwaukee.....	Todd D. D. & Const. Cpn.....	84.7	78.9	81.6	74.
6	Cincinnati.....	Todd D. D. & Const. Cpn.....	80.6	65.4	73.4	60.9
7	Raleigh.....	Beth. S. B. Cpn. (Fore River)..	51.4	33.3	47.5	30.6
8	Detroit.....	Beth. S. B. Cpn. (Fore River)..	51.2	33.1	47.4	30.5
9	Richmond	Wm. Cramp & Sons Co.....	62.	....	60.	....
10	Concord	Wm. Cramp & Sons Co.....	60.	....	59.	....
11	Trenton	Wm. Cramp & Sons Co.....	41.	....	40.	....
12	Marblehead.....	Wm. Cramp & Sons Co.....	39.	....	38.	....
13	Memphis.....	Wm. Cramp & Sons Co.....	32.	....	31.	....
<i>Auxiliaries</i>						
Fuel Ship No. 18, Pecos.....		Boston Navy Yard (Oiler AO 6)	75.5	73.8	67.4	65.4
Ammunition Ship No. 2, Nitro (AE 2).....		Puget Sound Navy Yard.....	99.9	99.8	99.9	99.5
Repair Ship No. 1, Medusa (AR 1).....		Puget Sound Navy Yard.....	58.	40.3	55.5	38.4
Dest. Tender No. 3, Dobbin (AD 3).....		Philadelphia Navy Yard.....	52.3	52.	50.3	50.
Dest. Tender No. 4, Whitney (AD 4).....		Boston Navy Yard.....	19.5	7.6	17.6	6.
Sub. Tender No. 3, Holland (AS 3).....		Puget Sound Navy Yard.....	14.	....	9.5	....
Aircraft Tender, Wright (AZ 1).....		Tietjen & Lang.....	57.	....	48.	....
<i>Patrol Vessels</i>						
Gunboat No. 22, Tulsa (PG 22).....		Charleston Navy Yard.....	59.8	41.8	55.	39.

* Battleship No. 45—Launched 3/22/21.

In addition to the above there are under construction 15 destroyers and 41 submarines.

There were delivered to the Navy Department during March, 1921, six destroyers and the ammunition ship *Nitro*.

Authorized but not under construction or contract 12 destroyers, 7 submarines and one transport.

The routing next in order in quantity of cargo was from the Atlantic coast of the United States to the Far East (Japan, China, Philippines, Straits Settlements, etc.). It aggregated 1,350,273 tons, or 6.7 per cent less than the cargo from the west coast of South America to the United States. Third in order was the route from the west coast of South America to Europe. Over this there passed 1,062,702 tons.

The fourth routing, in amount of cargo, was from the east coast of the United States to the west coast of South America, 893,393 tons. The fifth was from the west coast of the United States to Europe, 749,447 tons; and the sixth was from the Atlantic coast of Mexico to the west coast of South America, 659,777 tons, principally fuel oil.—*The Nautical Gazette*, Mch. 12, 1921.

PRESENT STATUS OF THE MERCHANT MARINE OF THE GREATER NATIONS.—In a paper by Maxwell Ballard, presented before the Northeast Coast Institution of Engineers and Shipbuilders, at a meeting at Newcastle-upon-Tyne, in December last, advance sheets of which have lately been received, a comparison is given of the present status of the principal merchant marines, compared with two previous years.

Mid Year	1909	1914	1920
World Total Sea-going Tonnage	34,467,295 Per cent	43,143,436 Per cent	51,786,120 Per cent
United Kingdom	47.9	43.8	35.1
Germany	10.75	11.0	.81
U. S. A.	4.49	4.81	24.1
Norway	3.67	4.54	3.82
France	4.20	4.46	5.72
Italy	2.79	3.32	4.27
Holland	2.62	3.39	3.44
Japan	3.1	3.96	5.78

Concerning this table, Ballard remarks as follows: "The three striking features are our loss of actual tonnage and preeminence of position, the elimination of Germany as a shipping power and the jump into second place of the United States. In every probability Germany's complete loss of place is temporary. There are already signs of efforts of recovery which are satisfactory in that there can be no revival of world trade of any account until Central and Eastern Europe settle down to steady work and production."

Attention is, however, called to the fact that the important point, the special subject of the paper is the freight tonnage; that is, the tramp steamers or cargo carriers, which meet in competition and rule the ocean freight market. Moreover, the only vessels now of account in this competition are steel steamers and motor vessels. Eliminating all other types, the figures are:

	1914	1920
Number of vessels.....	15,023	17,549
Tons	24,934,831	32,518,440

The last total includes steel coasting tonnage, which it was not possible to exclude accurately. A significant remark by the British engineer is: "Our interest centres upon our own position and that of the U. S. A., the really serious competitor, since the tonnage of both countries includes 60 per cent of the total world tonnage."

A statement issued lately by Lloyd's Register shows that the aggregate tonnage now in course of construction in Great Britain is a little over 7,000,000 tons, 51.6 of which is under construction. The United States' share of total tonnage building has fallen from 37.7 per cent to 18.2 per cent. To-day, the United Kingdom is building more than all the rest of the world combined, a position held by the United States during the late intensified

shipbuilding campaign. The following data, taken from a recent issue of the *Philadelphia Public Ledger*, will be of interest in this connection:

"The status of world shipbuilding now, as compared with a year ago, is shown by the following table of gross tons of shipping under way at the two periods:

	Dec. 31, 1919	Dec. 31, 1920
United States	2,966,000	1,310,000
United Kingdom	2,994,000	3,709,000
Other countries	1,901,000	2,160,000
World total	7,861,000	7,179,000

"This table does not include figures from Germany.

"How Great Britain has been resuming its place as the world's shipbuilder is indicated in that of the 3,709,000 tons now under construction; 1,257,000 tons is for purchasers abroad."

The same issue also reports the arrival, in Berlin, of a commission in the Harriman interest, to effect a joint agreement with the Hamburg-American Company.—*The Journal of the Franklin Institute*, March, 1921.

THE MODERN CARGO VESSEL.—In order to appreciate the real value of the modern cargo vessel, and its adaptability to the needs of the twentieth century, it will be advisable to note that the status of self-propelled vessels at various epochs. It will not be necessary to go further back than the discovery of America, as that marks the real beginning of ocean transportation. The flagship of Columbus is stated to have been a vessel about 100 feet long and its gross tonnage, according to present measurement, was about 250 tons. The records indicate an average speed of only four knots on the voyage to this side of the Atlantic, although the wind was favorable most of the time.

The size of vessels increased considerably during the century immediately following the discovery of America, and the Spanish, in particular, carried on considerable trade between the Philippines and Panama and thence to Spain. The English vessel of this date was still quite small, as the largest of the vessels which landed the first colonists in Virginia in 1607 was only about 80 feet long.

The advent of the marine steam engine in 1807, or thereabouts, marks one advance without which the modern cargo vessel could not have been developed. For many years steam power was applied through paddle wheels, and seagoing wooden paddle steamers were in use for transatlantic travel from 1819, when the American steamship *Savannah* made her maiden voyage, until after the Civil War.

Two other essential developments were made during the nineteenth century. The screw propeller was perfected so as to be commercial, the first use on a merchant vessel of which I have been able to find a record having been in 1838 on the *Robert F. Stockton*. In 1841 only three English merchant vessels had been fitted with screw propellers. This type of propeller removed the primary disadvantage of steam propulsion, and its later development definitely relegated the sailing vessel to a minor position in the world's commerce.

The application of iron and steel to ship construction was the other development which has made the modern cargo vessel possible. The first iron steamboat was the *Aaron Manby*, built in 1820, for service between London and Paris. The first iron vessel to cross the Atlantic is stated to have been the first screw steamer previously mentioned, the *Robert F. Stockton*. Many of the early iron vessels were small, but the possibilities of iron in ship construction were foreshadowed in the *Great Eastern*, 680 feet long, which was begun in 1854 and completed in 1859. No other vessel of that date exceeded 400 feet in length, so that a large step forward was made at that time in the size of vessels. While the *Great Eastern*

accomplished a useful work, particularly in laying the first submarine cable, it was too large for the commerce of its day, and could not be considered a commercial success. I find a record in a notebook of my father, who was then living in Norfolk, Va., under date of August 4, 1860, which reads: "To see the *Great Eastern*—\$2.00."

Mild steel was introduced in about 1876, and the modern cargo vessel is possible only on account of the development of the steel industry, in which the state of Pennsylvania has played no mean part.

The modern cargo vessel is built of mild steel, is propelled by a screw propeller operated generally by steam machinery, is steered with a rudder operated by steam and controlled from the bridge, is navigated by magnetic compass, has its location determined by chronometer and sextant, and has its cargo handled by block and tackle from booms on masts or derrick posts by means of steam winches. The size, arrangement, speed and fuel are specialized to suit the exact requirements of the trade, and few trades call for exactly the same design.

The cargo vessel of the future may be built of high tensile or special steel, but there are no indications at present that mild steel will be superseded in the near future, except on the largest vessels. It may have some other kind of propulsion than by a screw propeller, but there are no indications of any more efficient method, although some improvements may be made in the type of screw. The reciprocating steam engine is being superseded by the geared turbine, and the turbine is being used also in conjunction with electric generator and motor, instead of gears. The water tube boiler for generating steam is now becoming almost as well known as the cylindrical boiler, and the majority of new vessels use oil as fuel instead of coal. The internal combustion Diesel engine is being developed and used, and it is possible that this will be the prime mover of the future on account of its economy, unless oil becomes too expensive to be used at all. Electric motors are well suited for operating any type of steering gear, including hydraulic, and when steam is not used for propulsion, electric auxiliaries are the natural arrangement. The gyro-compass may replace the magnetic compass, as the gyro-compass is now used on Atlantic liners and in the navy. The variation of the magnetic compass, first discovered by Columbus, is still a source of confusion, and the deviation of the compass due to the ship's magnetism is a continual cause of anxiety to the navigators. No substitutes for the chronometer and sextant are being experimented with, so far as I know, but the "wireless" is already being used to give the location near the coast in a fog, and to check the time. Electric winches are common on naval vessels and are used also when internal combustion engines constitute the propelling mechanism.

Reinforced concrete is being used in the construction of cargo vessels to a limited extent. The aggregate used weighs much less than that used in land construction, so that the concrete vessel is not so very much heavier than the steel vessel. Concrete, however, is liable to develop cracks under tensile stress, and the sides seem to be susceptible to damage in docking. It does not seem likely to be much used for ship construction in the future. In a well-designed steel vessel of large size, almost all of the steel is required to withstand tensile stress, and so no reduction in the amount of steel used for reinforcement could be made, as the concrete is of value only in compression. The weight of the concrete must be almost entirely in excess, therefore; and the reduction in cost of construction, if any, can hardly be great enough to offset the loss in deadweight.

The size of a cargo vessel is made to suit the length of voyage and the amount of cargo available. There is no economy in having a large vessel in a given trade unless the vessel can be fully loaded on most of her trips. The commercial life of a vessel may be taken as twenty years, and a depreciation of at least 5 per cent per annum on the investment should be allowed as a part of the cost of operation. Not less than 5 per cent interest on the investment should be gained in addition, and repairs will amount to

an average of not less than say 2 per cent of the first cost, so that not less than 12 per cent of the first cost must be carried each year in addition to the cost of operation. The first cost, therefore, is of prime importance in determining the particulars of a vessel. Other things being equal, the cost increases with the size, and therefore the vessel should not be larger than the amount of cargo justifies.

The economy in operation resulting from increase in size, however, is very great. It takes very few more in the crew to man a vessel of 10,000 tons than to man a vessel of 5000 tons, as the same number of licensed officers are required on each vessel and only about six additional men are needed in the crew. The horsepower required for the same speed is increased in the larger vessel by only about 50 per cent, and the machinery may be made somewhat more economical so that the fuel consumption will be increased by less than 50 per cent. If the operating costs of crew, fuel and supplies amount in the course of a year to 30 per cent of the first cost in the case of the smaller vessel, they would amount to only about 24 per cent in the case of the larger vessel.

The larger vessel would carry about two and a quarter times as much cargo in the course of a year, as the machinery and fuel would occupy proportionately less space and weigh proportionately less, and the number of voyages need not be less, as the slight increase in the time in port, if any at all, would be counterbalanced by the less interference with regularity of speed on account of bad weather.

The first cost of the larger vessel would be considerably less than double that of the smaller vessel, on account of the fact that the weight and cost of the hull and fittings is not twice as great and the cost of the machinery would be only about one and a half times as much. The first cost may be taken as about 1.8 times as great.

The advantage of doubling the size of a vessel, then, may be summarized as follows:

The carrying capacity of the larger vessel will be about $2\frac{1}{4}$ times as great.

The operating cost of the larger vessel will be about 36 per cent of its first cost when the operating cost of the smaller vessel is 42 per cent of its first cost.

The first cost of the larger vessel will be about 1.8 times the first cost of the smaller vessel.

The comparative cost of operation of the larger vessel per ton of cargo will be only about three-quarters as much as the similar cost for the smaller vessel.

The natural thought would be that by increasing the speed of a vessel quite an advantage would be gained. Such is seldom the case, however. If a vessel, for instance, has a speed of nine knots and spends two weeks at sea to one in port, the first cost of a vessel to carry the same weight of cargo each trip would be nearly double for an increase in speed of 50 per cent, and the cost of operation would be at least double, while the faster vessel would carry only 30 per cent more cargo in the course of a year. It is this economic fact which keeps the average speed of cargo vessels so nearly the same as it was twenty years ago. The tendency in this country, however, is to build for a speed of between 10 and 12 knots, and few vessels are being built of less speed than 10 knots. The effect of bad weather is much greater on the slower speed vessels, and the increased length of time the cargo is in transit operates to reduce the freight rates. It is generally conceded that only vessels for carrying passengers and express freight should be designed for speeds in excess of 16 knots, and quite a number of passenger vessels are running at a speed of about 14 knots. The larger the vessel the less the economic disadvantage in the higher speed, as the power required for the same speed does not increase directly as the size of the vessel but only as about the two-thirds power of the displacement, and a somewhat higher speed can be obtained without using as great a proportion of the displacement for machinery and fuel.

The underwater form of a vessel may be made quite bluff if a low speed is deemed sufficient, but the lines must be made finer as a higher speed is sought. The block coefficient is the term used to denote the proportion which the volume of the vessel under water bears to the circumscribed parallelopiped. For a speed of 10 knots the block coefficient is about 80 per cent in a vessel 400 feet long, and may be increased to 82 per cent in longer vessels, while it would be reduced to 78 per cent in a vessel 350 feet long. It ranges between 78 and 82 per cent in the ordinary cargo vessels. As the speed increases, the block coefficient is reduced, and in some recent freight and passenger vessels 518 feet long and designed for a speed of 16-17 knots, it was made as small as 65 per cent.

The high cost of construction of the hull, and the broken stowage, however, do not recommend such a fine block even though a higher speed is obtained for the same power. Bad weather reduces appreciably the speed of a very fine vessel, causing heavy pitching, so that a vessel should be neither too bluff nor too fine. The present tendency on cargo vessels is toward a fining of the bluff bows which were so common earlier in the century, and also toward fining the stern, not only to preserve the trim, but also to give a better flow of water to the propeller and to gain in efficiency of propulsion thereby.

The above water form of hull of modern cargo vessels provides usually a flaring bow in order to prevent the waves from breaking over the deck, a smooth sheer line with about twice the rise forward as aft, with erections to suit the needs of the service. In most of the fabricated vessels there is no sheer at all, but such vessels are not as good sea boats, and under the present rules for determining freeboard they cannot load as deeply. Many vessels have been built in this country with a straight sheer for the half length or more amidships and with a quick sheer forward and the usual amount of sheer aft. This practice simplifies the construction, increases the strength somewhat, and does not offend the average eye. It will probably come into more general use, especially when the rules for determining freeboard are made rational instead of empirical.

Vessels with forecastle, bridge and poop are still the most common, although the shelter deck type is coming more into favor. The latter provides more cubic space for the same weight of cargo, and is better adapted for general cargo on that account.

The submarine is not likely to be a competitor with surface vessels in the carrying of cargo, as all the troubles of surface vessels are magnified greatly when the complications of running submerged are added.

Cargo vessels may be divided into two general classes—liners and tramps. The former are like business men who travel between home and office with an occasional stop off at the club for lunch. The name of the latter is a misnomer as they do not correspond to tramps at all, but more nearly to the harvest hands who work wherever they can find work to do.

If a vessel is not always sure of a return cargo, and has no means provided for a large amount of water ballast, the machinery is usually placed amidships. This is the common type. In oil tankers, colliers, and a few liners, including some vessels carrying passengers, the machinery is located aft, and this type of vessel is becoming quite numerous. The midship portion of the vessel is the best for carrying cargo, while the machinery fits very nicely in the stern, and the troublesome shaft alleys are avoided.

The type of steam engine installed on most cargo vessels is the inverted vertical three-cylinder triple-expansion reciprocating engine. This type has been in use for about forty years, the first successful one having been installed in 1881 in the *Aberdeen*. It has been improved in details, and the ratio of expansion has been increased as the boiler pressure was raised, but it is essentially the same machine, and engineers have become so accustomed to it that a breakdown in service is almost unknown. A number of four-cylinder triples are in service, and the four-cylinder quadruple engine is quite common in liners, and very economical.

The geared turbine was introduced in cargo vessels in 1910 by Sir Charles Parsons on the *Vespasian*, as the only method of using steam turbines on slow speed vessels with any economy. The modern gears are not of the same type as were used sixty years ago in the *Great Eastern*, for instance, but are of steel cut with the minutest accuracy. A high speed of revolution is necessary in order that a steam turbine shall function with economy in the use of steam, while a slow speed of revolution is necessary in order that the propeller shall be efficient. A gear ratio of 15 to 1 is about the average for a single reduction, while a ratio of between 30 and 40 to 1 is used with double reduction gears. Both the Curtis and Parsons type of turbines are in common use, but neither have displaced the reciprocating engine as yet. So many are now in use that the reliability of both the turbines and gears will be determined shortly, and as they weigh less, take less room and have possibilities of economy greater than the reciprocating engine, they seem sure of an extended use in the future.

Electric propulsion was introduced on the navy collier *Jupiter* in 1913 by the General Electric Company, and has recently been fitted on merchant vessels. In this system of propulsion an electric generator is driven by a high-speed turbine, and the propeller is operated at a suitable speed by a motor. The steam consumption is very moderate, and some eminent marine engineers in this country consider that the electric drive is one of the coming forms of propulsion for cargo and passenger vessels. It is slightly heavier than the reciprocating engine and much heavier than the geared drive, and probably will prove more expensive to build, so that its future use will depend on how well it can overcome these handicaps in the course of its development.

The internal combustion oil engine for marine use was introduced in Italy in 1910. It has been developed up to units of slightly over 2000 horsepower, and its consumption of fuel oil is reported to be only half as much as in the best form of steam machinery. In its present state of development, it is considerably heavier than steam machinery of the same power. The earlier installations have not always proved reliable, but as experience has been gained in its design, construction and operation it has given greater satisfaction in service. At present, its first cost is considerably in excess of steam machinery, and the power of a single unit is limited, so that it offers no immediate advantage financially except on long voyages on which the saving in the fuel supply needed will enable a heavier cargo to be carried. A recent American installation is that on the *Cubore*, which came out in the summer of 1920.

The use of steam machinery for marine purposes was handicapped until the cylindrical multitubular boiler, commonly called the "Scotch" boiler, was developed in about 1862. As the steel mills became able to roll larger and thicker sheets, this type of boiler increased in size and ability to carry heavier steam pressure, so that one single-ended four-furnace boiler 17 feet in diameter can now be built to generate steam at 200 pounds per square inch, sufficient for an indicated horsepower of 1200 or more, although three-furnace boilers for a working pressure of 160 to 180 pounds are the common size. This type of boiler can be used to burn either coal or oil, and like the reciprocating engine, it is so well known that a breakdown in service is rare, although repairs on account of carelessness are not as infrequent as they should be.

The water-tube boiler was introduced in the merchant service about twenty-five years ago, and has been used quite extensively recently, especially in connection with oil as fuel. It is considerably lighter than the Scotch boiler, but, on account of the small amount of water contained, it requires more care in operation. The Scotch boiler has nothing to recommend it theoretically, but its reliability keeps it in use, and like the reciprocating engine it is likely to be installed in cargo vessels for many years yet.

The fuel used in cargo vessels until quite recently was bituminous coal. Anthracite coal was discarded after a few years of use, as it was found

to be more difficult to adapt to the varied requirements of service. Many cargo vessels do not have artificial draft, but quite a number of coal burners are fitted with heated forced draft, introduced by James Howden in 1884. Since the advent of fuel oil, its use on board ship has been extended so that very few vessels of the present day are designed for coal burning, although the greater number of the vessels afloat still burn coal. The tramp and the liner are both dependent on fueling stations. Very few vessels carry enough fuel for a round trip, and some of the routes are so long that fuel must be taken on at an intermediate station. The United States has about twenty-one commercial fueling stations at which oil can be obtained, in addition to its home ports. England has numerous coaling stations scattered over the world, but fuel oil is not obtainable except at a comparatively few ports, so that tramp steamers cannot use oil with satisfaction. At first, steam was used to atomize the oil, but that method was found unsatisfactory on account of the waste of fresh water involved, and at present the oil is heated to vaporizing temperature and sprayed mechanically. Heated forced draft is used to burn the sprayed oil, in most cases, and very satisfactory economy is obtained.

Ships are built to stay at sea in stormy weather, and their structure must be strong enough to withstand wind and wave. In the days of the wooden ship, the effect of storms was shown first in the working of the seams, and pumping had to be resorted to regularly to keep down the leaks. In steel ships, the strength of the bottom of the vessel is usually greater than that of the deck, and the riveted seams do not leak so easily, so that except in old vessels a defect of strength was indicated by the posting of the vessel as missing. The stresses in a vessel are greatly increased if the vessel is overloaded, but the effect of overloading is not felt except in a storm. It was some time before this fact was properly appreciated, and a limit to the loading was found to be necessary.

In Great Britain, Mr. Samuel Plimsoll took the matter up in 1875, and an Act of Parliament was passed requiring a mark to be located amidships on each side deeper than which a foreign-going vessel should not be loaded. This mark is known as the "Plimsoll" mark. Its location is determined for British vessels since 1890 by certain rules known as Freeboard Tables based on retaining a certain percentage of buoyancy at the load draft, and assuming that the strength of the vessel was that obtained by using the scantlings required for the vessel by Lloyd's Register of Shipping and set forth in Lloyd's Rules.

In the United States there is no legal enactment to prevent overloading, although a committee has been appointed by the Secretary of Commerce to formulate recommendations. A British committee has recently proposed a modification of their freeboard tables basing the loading on an absolute criterion of strength, so that the stronger a vessel the deeper she will be allowed to load. With proper precautions as regards the tightness of hatches and the safety of movement of the crew, this would seem logical. It is hoped that our government will afford a similar measure of protection to the humble cargo vessel. In the matter of loading, the stresses increase more rapidly as the draft increases, and even a foot of overloading is likely to strain the structure in a storm, and if persisted in to cause the loss of the vessel.

The hull of a vessel is essentially a hollow girder. The shell is stiffened by frames, and is subdivided by diaphragms called bulkheads; if vertical, and called inner bottom or decks, if horizontal. The weather deck of steel and iron cargo vessels for a number of years was made of wood, later of iron or steel sheathed with wood, but in general wood decks have been discarded except over the quarters for the crew and passengers. In the early days of iron ships, only bars and plates were rolled, but the advantage of rolled shapes was so apparent that angle and other sections were

soon obtainable in a great variety of sizes. In the ordinary cargo vessel about two-thirds of the steel is plates and one-third shapes.

Following the method of framing adopted in wooden vessels, the frames were fitted transverse to the length. This type of framing was the only type which could be used in composite vessels; that is, vessels with metal frames and wood planking. The classification societies prepared rules for the scantlings with transverse framing, and as transverse frames are easily fabricated and erected, this type of framing became the sole type used for many years, and is now used on the majority of cargo vessels, with the exception of tankers. In the middle of the nineteenth century, John Scott Russell developed the longitudinal system of framing, as exemplified in the *Annette*, the *Great Eastern*, and a number of others. In this system, there are a number of widely spaced rigid transverse members which support longitudinal frames by which the shell plating is stiffened. This method of framing went out of use, because channel and bulb angle sections were not rolled at that time, and the cost of fabrication and erection of the plate and angle sections was too great. The advent of the bulk oil carrier, the tanker, showed the necessity for some type of framing better suited than the transverse, and the longitudinal system was re-introduced by Mr. J. W. Isherwood in 1908, using rolled sections for the longitudinal frames and making the transverse members much deeper than the longitudinals so that the latter could fit in slots cut in the edge of the transverses. This type of framing has proved very satisfactory on tankers, greater strength being obtained with less weight of material. It is used with advantage on other types of vessels also, but transverse framing is still the more popular for ordinary freighters.

It is very difficult to calculate the stresses to which the various parts of a ship are subject, so that it was early found necessary to prepare tables and rules giving the scantlings to be used in the construction of the hull and machinery of vessels of ordinary size. These rules were mostly empirical, and a damage on one vessel was often the occasion for penalizing all vessels thereafter built. These rules were issued by classification societies, and if a vessel were built according to the rules it was eligible for classification, and upon payment of a fee it was assigned a class. The classification societies issue register books listing the general particulars of all vessels, including their class or rating, and this rating is accepted by the marine underwriters in fixing the premium for insurance on the vessel and its cargo. To be efficient, a classification society must have surveyors at all the principal ports, as well as at the building yards, so that proper repairs may be required in case of breakdown. Inspection at frequent intervals is required in any case, as deterioration and wear are inevitable, and many so-called accidents are avoided by remedying the defects disclosed by these periodical surveys. The dominant society is Lloyd's Register of Shipping, an English society which is godfather to more cargo vessels of all nationalities than any other. In the United States, the American Bureau of Shipping has been recently strengthened, so that it is no longer necessary to rely on a foreign institution for the classification and survey of vessels under the American flag.

The question of insurance and underwriting is of prime importance, as very few shippers are willing to trust their goods in the cradle of the deep, no matter how staunch the vessel may be in which they are rocked. Even the United States Government requires insurance on everything belonging to it that is not carried on a naval vessel—a procedure which is not warranted by the underlying basis for insurance, as it can well afford to carry its own insurance. Steps are being taken at the present time to extend American underwriting, so that we may be independent of foreign nations in that respect also. This is particularly fitting, as a ship of a country carries its flag and represents its nationality.

A cargo vessel considered as a unit may be likened to a beast of burden—seldom good-looking and usually devoid of dignity. It needs a certain

amount of care from those in authority, however. It should not be overloaded, else its back will break—and vessel, cargo and crew are likely to be lost. It must not be driven too hard else the boiler will explode, or the shafting break, or the steering gear become deranged—and the sea is not safe for a vessel which is not under control. It should have careful officers, else collision, grounding or shipwreck will result, and the repair bills will eat up the profits even if the vessel and cargo are saved. The Steamboat Inspection Service is empowered by the government to examine and license the officers of a vessel and to inspect the machinery and hull. The owner of an American vessel is allowed to load his vessel as he may consider expedient, however, and while he often gets by with a foot or two of extra draft, there are many cases of vessels never being heard from which are doubtless lost on account of overloading. The British shipowner was equally inconsiderate not so many years ago, but the load draft of British vessels is now limited by law, and the Plimsoll mark placed on each side amidships defines the draft, as previously mentioned.

Cargo vessels of a country considered as a group, together with the passenger vessels, form its Merchant Marine and should be invested with the dignity of upholding the honor of the country in the ports of the world. No country can live to itself. Japan of a century ago is the nearest example of a nation of any size attempting to be self-contained. As soon as it opened its ports to commerce, however, it began to grow and develop, until now it is one of the influential nations of the world. The United States has natural resources unsurpassed by any other country, but it is dependent on other countries for certain commodities which are not found or raised here in sufficient quantities to satisfy our wants. We import coffee from Brazil, sugar and iron ore from Cuba, nitrates from Chile, cork from Spain, oil from Mexico, and various other commodities from other countries.

It is generally recognized that this country should be as self-supporting as possible, and for many years our manufactures were encouraged by a protective tariff. But no country can excel in all kinds of manufactures, so that our imports of manufactured goods are of large volume and are likely to continue large. On the other hand, we have for export foodstuffs, cotton, coal, oil and the manufactured products in which we excel. Civilization is advanced by this interchange of commodities and prosperity is dependent on it. Some countries excel in the building or operation of ships. Such countries do most of the carrying trade of the world, and rightly so. But a country as large and powerful and influential as the United States loses a measure of its independence when it allows other nations to carry all of its foreign commerce. It is as much an essential that it shall carry a large proportion of its commerce as that it shall manufacture the major portion of the articles it uses and raise the major portion of its foodstuffs. The more independent we are as regards raw materials and manufactures, the less need there is of a large merchant marine. But if we *must* import and export commodities, we should have a merchant marine of our own sufficient to carry what we really need. If all nations were similarly situated, the proportion of the cargo vessels of the world controlled by each would be distributed according to the amount of the commerce of each nation. Some nations, however, are not able to build or operate vessels economically and cannot afford to do their own carrying. We are not in that class. Under ordinary conditions, we cannot build and operate vessels as cheaply as some other nations. But we can afford to carry our own commerce, just as we could afford to do our own manufacturing. Our independence requires that we shall do our own carrying, and we must not fail to arrange for so doing.

How did we build up our manufactures? We did not buy other nation's manufactures just because they were cheaper than ours, but we put on a tariff that enabled us to compete with foreign goods and to build up our own industries. We must do the equivalent with ships. How? A subsidy would accomplish the purpose with us, as it has with other nations. But

a subsidy is liable to abuse, and has not as yet been recognized as proper by the nation at large. Discriminating duties would accomplish the purpose in part, but would help only on vessels importing dutiable articles. Discriminatory tonnage dues would supplement the discriminating duties, and would apply to all vessels entering or leaving our ports. Tonnage dues are the nearest equivalent to the protective tariff, and could be regulated to a nicety to enable this country of ours to have such a merchant marine as our independence requires, without placing any more burden on any section of our people than the tariff did, and could be removed in whole or in part if our cargo vessels, like our manufactures, ever reach the stage of development when no protection is needed, or when all the rest of the world has the same scale of living as ourselves, if such a condition were possible.

The difference in cost of operation is so great, averaging at present probably 50 per cent more than our competitors, that to balance the difference in freight rates required to offset the extra cost of operation the amount of discrimination in duties, and the difference in tonnage dues, will have to be quite great for awhile at least. The money which reverts to the Treasury on account of the increased tonnage dues on foreign ships will have to be paid out in some form of subsidy, also, as the vessels engaged in long-distance trading and making few entries in a year will need as much assistance as the vessel making many round trips in the same time. The foreign vessel will not have to increase its freight rate appreciably on account of the increased dues, so that the American vessel will not be able to recoup itself for the increased cost of operation on the long voyage by an appreciable increase in the freight rate; and this increased cost must be met by some form of subsidy. The details can be worked out, however, without much trouble, if the American Merchant Marine is recognized as a national problem and treated as a matter affecting the welfare of every citizen, as it should be treated.

We are interested in the modern cargo vessel as an efficient instrument for the carrying of the world's commerce and for the advancement of civilization, and also from a national viewpoint as a means of maintaining and protecting the independence of these United States of America. For this latter purpose, no minor sacrifice should be allowed to overshadow the great gain in independence which will result from our ownership and operation of a large fleet of modern cargo vessels.

The present status of American shipping is anomalous, as the United States Shipping Board has built during and since the war a much larger number of vessels than the country is able to operate advantageously. Ship operation is a very difficult subject, having many ramifications, and must be of comparatively slow growth if it is to be able to endure the vicissitudes to which it is more subject than the average business. The great problem before this country at present is not a lack of vessels, but a lack of experienced operators to manage the vessels. Any marine policy which overlooks this fact is doomed to failure. The difficulty of the task, however, should not deter us from tackling it in earnest, and the nation which bore the honors in shipping a century ago is doubtless able to repeat its performance at the present time.—*The Journal of the Franklin Institute*, March, 1921.

AERONAUTICS

A SINGLE AIR SERVICE.—If it should be the purpose of President Harding to bring about unity of the army and navy air services, or, to put it in another way, to establish a separate air department upon which the army and navy could draw for equipment and trained aviators, he would find high officers of the army and navy opposed to the plan. It is reported in Washington that Mr. Harding has been won over to the idea of a single air department. The General Staff has advocated a distinct army aviation corps. In a letter to Major Gen. Charles T. Menoher, Director of Air Service for the War Department, General Pershing on January 12, 1920,

took a very decided stand against the single air service. "A military air service," he said, "is an essential combat branch and should form an integral part of the army," adding that it should "be separate only in the same way that infantry and field artillery are separate."

That is also the view of Major Gen. William G. Haan, who commanded the Thirty-second Division in France. He had an unsatisfactory experience with an American air unit assigned to him until it came absolutely under his control. But this experience cannot be considered a sufficient test of the capacity and usefulness of air units trained in the supple and thorough organization which the proposers of a single service have planned. The argument that efficiency and tactical availability can be obtained only if aviators are "an integral part of the army" has never been convincing. It is the view of the tactician proud of his own service and averse to going outside of it for personnel and material. In the navy, as well as in the army, there is a good deal of opposition to a single air service and for the same reasons.

Great Britain adopted a single air department some time ago. It may not function perfectly, but that is because of its comparative newness. Perhaps the sanest criticism of it is that it has not been entirely independent of Ministerial control. Air Marshal Sir H. M. Trenchard has said that "the work of the air service either on land or sea, in spite of its many and various aspects, can only achieve its greatest efficiency if regarded and carried out as a single co-ordinated effort." What the army and the navy want in a campaign is the best aeronautical equipment, together with thoroughly trained scouts, photographers, bombers and mechanics. The need could be best supplied by a service that concentrated all its energies upon maintenance and efficiency and was not embarrassed by army and navy regulations, which too often are not adjustable to sudden emergencies. An air unit assigned to a field force or to a squadron would automatically become an integral part of it, being subject to the commander's orders. Unification of the army and navy air services would obviate duplications and make for economy, and Congress would not be pulled about and confused by the demands of two services. Civilians in Congress, like Senator Wadsworth and Senator New, and like Julius Kahn in the House, are broader and more practical in their views of aviation reform than are the generals and admirals who speak only in service terms. The enabling legislation would have its problems, but at hearings of the Military Affairs and Naval Committees they could be thrashed out and a workable law evolved.—Editorial in *N. Y. "Times."*—*The Aerial Age Weekly*, Mch. 28, 1921.

EUROPE'S WAY WITH FLYING.—Great Britain has decided, publicly at least, that the basis of her one-power navy is to be the capital ship. Still it is important to note that she is spending approximately \$73,614,000 on aviation in 1921. Of this, \$3,525,000 is devoted to the encouragement of civil aviation and \$6,824,000 to research. The only parallel in the American budget to the first item is the \$1,250,000 which was voted for the air mail, yet the *London Times* is greatly excited over French competition in civil aeronautics.

"The French believe," it remarks, "that air power in time of peace is best won by allocating an appreciable percentage of their total vote to the development of civil aerial transport. News reached London yesterday that they have now decided definitely to spend approximately £3,400,000 at the present rate of exchange (or of over £7,000,000 at the normal rate) on purely commercial flying during the coming year, and that it has been agreed without question to allocate slightly more than £600,000, at the present rate of exchange, to the direct subsidy of their air lines."

This news, the *Times* believes warrants a new British subsidy to the London-Paris air route, though it already is encouraged to the extent of \$240,000 a year. This morning brings the news that the Air Ministry, short of funds to maintain all its 'planes and dirigibles in service, has

offered ten of the latter free to private companies wishing to operate them. The gift, if accepted, represents a subsidy of \$12,000,000. Meanwhile, German writers are urging a comprehensive effort for the creation of a great German commercial air industry. "During the next few years," says a writer in *Der Luftweg*, "aerial transport will need the support of state subsidies, but it will gradually be enabled to stand upon its own feet by progress in the technics of aeronautics and through the enlistment of the sympathy of the economical classes." Lines running throughout Germany and into contiguous countries are advocated.

The significance of this news is too apparent to one who has followed the American policy toward aviation. European nations are not only spending more money than we on aeroplanes, but they are spending it sensibly and with an intention to develop an industry as well as military air forces. The real efficacy of the latter, of course, depends on the former. In the United States, on the other hand, flying has been a sort of gutter-child, finding its food where it could and at times almost failing to find any. At present we are sinking from a brief but brilliant aerial activity into the state of official indifference from which we emerged in 1917. We have not entirely given up the idea of American flying, but we have shown a lethargy and bewilderment concerning it. The need is chiefly one of preserving the factories that make the planes and the engineering forces that design them. These tided over a few years, should be self-supporting. It is astonishing that, faced with the alternatives of a crippled industry and a modest study of and action upon the problem, we seem drifting toward the former. Flying, with its great industrial potentialities, is far more than a branch of the military service. It should get something of the serious attention here that is being given it in Europe.—Editorial in *N. Y. Globe*.—*The Aerial Age Weekly*, Apr. 4, 1921.

THE AERIAL MAIL.—The country not only can afford its air mail; it must afford it. Certainly at this time the country wants economy in the operation of its government. But there are some forms of saving which are very bad economy, and we are convinced that the attempt to kill the air mail belongs emphatically in this class. It is no argument to say that the air mail service should be eliminated because it costs more to carry mail through the air than on trains. It costs more to carry mails on trains than on canal boats, but we do not send mail from New York to Buffalo by the Erie Canal because of that fact—though there is some evidence to the contrary.

Those who claim that the air mail service is impractical belong in the class with those who ridiculed the *Clermont* as she puffed her way slowly but surely up the Hudson. Without the Clermonts of industry there are no Aquitanias. We ought to be thankful that the post office in one instance at least has had the courage to be forward-looking.

If there are unusual dangers involved in the air mail, it is not the part of courage or intelligence to drop the service on that account. The challenge to us is not to eliminate the dangers by leaving the air, but by fully conquering it.—Editorial in *The Outlook*.—*The Aerial Age Weekly*, Mch. 28, 1921.

AVELINE AUTOMATIC PILOT.—The object of the new device, which is the invention of M. Georges Aveline, a French engineer and former military pilot, is to control automatically every movement of an aeroplane with the exception of steering.

It consists of the utilization of compressed air combined with an electrical current. The air is automatically compressed by means of two small air pumps actuated by small air propellers immediately the aeroplane begins its flight. The air is conveyed by tubes into an atmospheric reservoir fitted within the fuselage, and is connected to a pressure gauge fitted in the pilot's cockpit. Above the pressure gauge is a switchboard with a lamp

fitted to the right and to the left. The atmospheric pressure is conveyed by tubes to a circular tubular container half-filled with mercury, and so contrived that as the level of the fluid metal rises to the left or to the right with the movement of the aeroplane, so it causes a contact to take place which permits an electric current to act on valves, and they set in motion the mechanical gear connected with the pilot's controlling mechanism. Simultaneously the right or left lamp on the switchboard lights up, indicating the variation of the equilibrium, the current being shut off and the lamp extinguished as the aeroplane is brought up to the correct level. By merely raising a small lever in the cockpit the whole of the mechanism is thrown out of gear and the pilot is free to take full control of the machine again.

One of the flights referred to included a trip to Paris and back, when Major Brackley, who is responsible for the tests, allowed the aeroplane to fly for two hours consecutively under the sole control of M. Aveline's invention. It has been tested under every conceivable circumstance with perfectly satisfactory results. (*Aeronautics*, Feb. 3, 1921.)—*The Technical Review*, Mch. 8, 1921.

SOME PROBLEMS IN AERONAUTICAL RESEARCH.—From an analysis of engine failures it is found that, where the cause can be definitely stated, 80 per cent are due to what can be termed "engine accessories," and only 20 per cent to the engine itself. The accessories include the petrol and water systems, the ignition system, including sparking plugs and any external lubrication system. So far we have been unable to obtain a really satisfactory flexible tubing to stand petrol.

The necessity for high flying during war is important, also in civil aviation in order to avoid clouds and to utilize wind to the best advantage, and for economy in fuel consumption. One of the chief difficulties is due to the fact that the horse-power developed falls off with altitude. The most obvious way of getting over this is some form of forced induction, but there are also possibilities in using a very high compression ratio—say over 6 to 1. This necessitates some form of throttling at low altitudes, otherwise the charge will detonate, and the most direct method is to throttle the fuel mixture direct, but Mr. Ricardo has recently pointed out that indirect methods will be more economical. One such method is to admit a definite quantity of cooled exhaust gas at each induction stroke, the quantity varying with the altitude.

Much advantage from maintaining the power of an engine at high altitudes is lost unless a variable pitch propeller is used, as it requires less power to turn a given propeller at the same speed at heights than it does on the ground.

There are two developments in engine design with which Germany is now experimenting. The first is a two-stroke engine by Professor Junker, in which he employs the principle of two opposed pistons working in one cylinder on to two crank-shafts; and the second one is a design by Hirth. This is also a two-stroke engine, but the engine exhaust is taken through the propeller and out near the propeller tips, so that the centrifugal force will cause a scavenging effect in the cylinder, and thus get over one of the principal difficulties of a two-stroke engine.

A problem that one is always facing in aeroplanes is that of landing in a fog or ground mist. Some instrument is wanted that will really tell the height above the ground, as with such an instrument, and an absolutely reliable engine, half the difficulties of flying in a fog at the present day would vanish. A device tried at Farnborough is known as the "Noakes ground indicator," and consists essentially in a lever hinged to the axle of the under-carriage and connected to the pilot's control stick. When the lever is released it hangs down, and is the first part of the aeroplane to touch the ground. As soon as the lever touches the ground it moves the control stick, thus flattening the aeroplane out, and at the same time the

pilot throttles the engine right down, so as to prevent the aeroplane going up into the air again and commencing a series of bounds. (Air-Commodore H. R. M. Brooke-Popham, C. B., C. M. G., *Aeronautics*, Feb. 3, 1921.)—*The Technical Review*, Mch. 8, 1921.

SOME FACTORS OF AEROPLANE ENGINE PERFORMANCE.—This report is based upon an analysis of a large number of aeroplane engine tests made at the U. S. Bureau of Standards. This report contains the results of a search for fundamental relations between many variables of engine operation.

The data used came from over 100 groups of tests made upon several engines, primarily for military information. The types of engines were the Liberty 12 and three models of the Hispano-Suiza. The tests were made in the altitude chamber, where conditions simulated altitudes up to about 30,000 feet, with engine speeds ranging from 1200 to 2200 revolutions per minute. The compression ratios of the different engines ranged from under 5 to over 8 to 1. The data taken on the tests were exceptoinally complete, including many pressures and temperatures, besides the brake and friction torques, rates of fuel and air consumption, the jacket and exhaust heat losses.

With the Liberty engine operating at from 500 to 2000 revolutions per minute and with the Hispano-Suiza 300 horsepower operating from 1400 to 2200, it is found that the friction torque increases approximately as a linear function of engine speed at a given air density, and approximately as a linear function of density at a constant speed. This means that the friction horse-power increases approximately as the square of the speed. Actually the relation of torque and speed is such that the friction horse-power increases with speed raised to a power between the first and second, this power increasing with speed, approaching the square. The relation depends upon the engine design, the speed, and density of the air. Any statement as to the distribution of the friction losses are based upon incomplete evidence; the indications are, however, that the pumping losses are about half of the total friction.

There is no doubt that for a given process of combustion and at a constant speed the engine power is directly proportional to the weight of charge supplied; in other words, proportional to the charge density at the beginning of compression. As a consequence, if operating conditions are sensibly constant except for altitude, the engine power will be closely proportional to the air density. The volumetric efficiency increases with increase of air temperature at constant pressure, so that power does not decrease as fast as the air density when the temperature is raised, due to changes in vaporization and heat transfer. (Victor R. Gage, Report No. 108, U. S. National Advisory Committee for Aeronautics, 1920.)—*The Technical Review*, Mch. 1, 1921.

AVIATORS TO BOMB EX-GERMAN WARSHIPS IN TESTS.—Washington.—A program for what promises to be the greatest naval and aerial gun and bombing test ever conducted has been approved for determining the relative effects of gun and bomb hits on certain types of war vessels.

In these joint army and navy tests which are to be made at sea between June 1 and July 15 next the obsolete American battleships *Iowa* and *Kentucky* and nine former German war vessels, allocated to the United States, will be used as targets. It is not the intention to sink the *Iowa* and the *Kentucky*. Dummy bombs will be used by the aeroplanes attacking these warships. All of the former German vessels, however, will be sent to the bottom.

The former German vessels are the dreadnought *Ostfriesland* and the light cruiser *Frankfort*, now in New York Harbor; three German destroyers now at Norfolk, and four German submarines, one of which, the *U-111*, is at Portsmouth, N. H., while the other three, the *U-117*, the *U-140* and the *UB-148* are at Philadelphia. Under a decision reached by the

Council of Ambassadors the destruction of the former warships is called for between May 1 and August 9 next.

Joint Board Agrees on Test.—Announcement of the government's plans for the tests was made by Secretary Daniels after he had approved recommendations made by the Joint Army and Navy Board, and sent the necessary instructions to Admiral Henry Braid Wilson, Commander in Chief of the Atlantic fleet.

The board met to reach an agreement relative to the experiments. The members on behalf of the army are Major Gen. Peyton C. March, Chief of Staff; Major Gen. William G. Haan, Director of Army Operations Division, and Brig. Gen. Henry Jervey, Director of War Plans Division of the General Staff. The navy's members are Admiral R. E. Coontz, Chief of Naval Operations; Rear Admiral J. H. Oliver, Director of Naval Plans Division, and Captain Benjamin F. Hutchison, Assistant Chief of Naval Operations. The army will be represented by aeroplanes and the navy by destroyers and a dreadnought.

There is pending before the Senate Naval Committee a resolution directing the Secretary of the Navy to turn over certain obsolete craft to the air service of the army, and directing the chief of the army air service to conduct tests in study and development of aerial attack on warships. Senator Page, as chairman of the Senate Naval Committee, has requested Secretary Daniels to report on the wisdom of passing such a resolution. Secretary Daniels wrote to Senator Page telling him what has been agreed on between the army and navy for the coming tests. In view of these, the Secretary wrote, the passage of the pending Senate resolution is considered unnecessary.

The battleship *Iowa* will be radio-controlled during the tests. She will be attacked with dummy bombs by aircraft, from a minimum altitude of 4000 feet, at a point within a zone between fifty and one hundred miles off coast between Capes Hatteras and Henlopen. The *Iowa* will try to avoid being struck by the bombs.

All Ex-German Ships to Be Sunk.—The Ordnance Department has been ordered to prepare 298 bombs for use in the attack on the former German ships. The bombs used will weigh 230, 250, 520, 550 and 1000 pounds or even more. One submarine is to be attacked and, if possible, sunk by bombs dropped from aircraft, while the other submarine will be subjected to shell fire from destroyers. If none is sunk by bombs they are to be destroyed by depth charges.

One of the three former German destroyers will be attacked by aircraft and the two others by destroyers. If aircraft and destroyers fail to sink them they are to be attacked by battleships, and afterward, if still afloat, are to be sunk by depth bombs. The first attack on the *Frankfort* will be by aircraft using 250-pound bombs; the second by aircraft using 520-pound bombs. After the army aircraft have their innings the cruiser, if afloat, will be examined and then will be subjected to gun fire from a division of American destroyers at 5000 yards range. If both gun and bombing attacks fail the *Frankfort* is to be sunk by depth charges.

The most spectacular attack will be directed against the *Ostfriesland*. The army aviators will attack her with 550 and 1000 pounds, or heavier bombs, either singly or in groups. Each attack will be followed by an examination of the battleship, if she is still afloat. Should the aircraft fail, the *Ostfriesland* will be shelled by an American dreadnought, firing 14-inch shells at a range of not less than 18,000 yards. Then, if the *Ostfriesland* still floats, she is to be sunk by depth bombs.

The ships are not to use machine guns, gas or incendiary or smoke bombs in defense.

The recommendations submitted to Secretary Daniels by Admiral Coontz, as senior member of the joint board, and approved, were in part:

Objects Sought in Tests.—"That the bombing experiments contained in the exercises to be conducted by the navy are designed to determine:

"1. The ability of aircraft to locate vessels operating in the coastal zone and to concentrate on such vessels sufficient bombing aeroplanes to make an effective attack.

"2. The probability of hitting with bombs from aeroplanes a vessel under way and capable of manoeuvring, but incapable of anti-aircraft defense.

"3. The damage to vessels of comparatively recent design which will result from hits from bombs of various types and weights."

No report of conclusions as to the probable damage to personnel or equipment or probable or actual damage to the watertight integrity of the target vessel or vessels in general is to be made except by a board in which the navy shall have representation. The results of the experiments and the conclusions drawn are to be held secret by the War and Navy Departments until passed on by the joint board.

Secretary Daniels' Orders.—In his instructions to Admiral Wilson Secretary Daniels said:

"In preparing this order the department has been guided by the following considerations:

"Successful naval warfare insures freedom of movement of our own merchant vessels and transports and denies freedom of movement to enemy vessels. Modern fleets will be accompanied by aircraft and vessels will be armed with anti-aircraft batteries. Operations against naval units operating in the coastal zone, from the point of view of the effectiveness of aircraft, divide logically into three phases—the location of such naval units, the ability of the aircraft to hit vessels with their projectiles, the ability of the projectiles seriously to damage a vessel."—*The Aerial Age Weekly*, Mch. 14, 1921.

THE NEXT STEPS IN COMMERCIAL AVIATION.—Enough time has now passed since the end of the World War to allow the subsidence of the tremendous inflation which it gave to aerial development. There has come throughout the world a return to normal conditions which permits us to reach fairly accurate conclusions as to the immediate future of aviation from the commercial point of view. The adaptations of the various war inventions to commercial uses are being worked out rapidly, and we know more or less definitely how much salvage from the great struggle is available for use in building up peace-time flying.

The most immediate danger to aviation progress is that the reaction from abnormal aerial activity of 1917 and 1918 will lead to an equally abnormal neglect for an indefinite period. This danger is particularly noticeable in this country and it is important to make certain that this slump does not carry America back to the position of inferiority in air work into which we had fallen five years ago.

America's contributions to flying during the great war were important from any point of view and especially in the direction of standardizing planes and engines and thus laying the foundation for economical and efficient flight on a large scale. Particularly in engine manufacture this country established principles and methods which, if developed, will go far toward putting aerial transportation on a basis permitting it to compete on advantageous terms with other forms of transportation.

It is extremely important that these advantages shall not be lost. There is no possibility, however, that this country will maintain competition with the military aviation on which European governments are now spending vast sums. America is not and never will be a military nation, and we may consider it settled that Congress will never approve a large air force in the regular army or navy or make large appropriations for aircraft experiment and equipment in peace time.

The problem must be solved on a commercial basis, using in every possible way foundations which the army and navy have provided, but developing peaceful air traffic of all kinds. This must be done in a way that will make it not only self-supporting but profitable enough to provide funds for the vast experimenting which is vitally needed in the immediate future.

There is every reason for optimism in regard to the possibility of doing this. America takes second place to no country in the matter of development and perfection of aeroplane power plants, except possibly in air-cooled fixed radials. We have apparently been surpassed on some points, especially by the Germans, in the development of aeroplanes and especially in the reduction of head resistance through the use of metals and the system of enclosing the framework in the wings. But the study of plane structure is proceeding successfully in this country and recent indications are that we will have little difficulty in meeting foreign competition on this ground also, if funds are available for the necessary experimental work.

However, if America is to make its commercial aviation fully successful, American engineers must be prepared to supply greatly improved machines of types suited to wide requirements. The principles underlying the constructions of these machines have already been firmly established and require very little development in most cases to reduce them to terms thoroughly practical. This work is, in fact, so slight as compared to the progress that has been made that we may confidently expect an immense development of aviation within a very brief time. That is, provided always that sufficient attention is paid to the subject. Although this development must necessarily be wholly along commercial lines, it will give us all requisite security from a military point of view. The experience of the war showed that it requires fully a year to develop an aeroplane engine. The designing of the plane itself can be done much more rapidly than this, when once the fundamental characteristics of the power plant have been established. An adequate development of commercial aviation will make it certain that any military emergency will find us equipped with engines of all desirable types, permitting a very rapid construction of the necessary war fleet. In the meanwhile, of course, adequate commercial aviation will give us for instant use immense squadrons of planes already tolerably well adapted, with slight changes, to military uses.

The air exploits of the past year show how nearly we have come to establishing the necessary foundation for complete commercial exploitation of aviation. Foremost, of course, is the splendid work that has been done by the Post Office Department in establishing and extending its daily mail service. The regularity with which the mails have been carried over long distances, in spite of weather troubles and other handicaps and the very small number of delays due to mechanical difficulties, shows conclusively that flying has now become for all practical purposes both safe and trustworthy.

This has been further demonstrated by several individual feats. The non-stop flight made by a navy type plane from Miami to New York and the Mineola-Alaska flight of four army planes are notable examples of this. In commercial work, the successful service maintained between Miami and various West Indian islands has also been notable. In another line, the work done by the Laurentide Company of Canada, which has used two naval planes for timber cruising and exploration in its vast holdings south of Hudson Bay, and which has found its machines so trustworthy that it has sent them hundreds of miles from civilization or any possible assistance, demonstrates strict commercial reliability.

These feats are the more notable in that they were all performed with engines of the twin-six Liberty type, built during the war for military purposes. The Liberty engine, remarkable as it was in many ways, is by no means the last word in aeroplane power plants, and developments since the war have produced engines with marked superiority in economy, in reliability and particularly in freedom from fire hazard. It is entirely natural that with the immense number of Liberty engines available, these improved power plants have not come into wide use. Their existence, however, shows that it is already possible to exceed the performances that have been mentioned.

With this record as a basis, it is possible to outline rather closely the developments in flying that may be expected within the next few years. They will naturally be along two general lines.

There will be developed, first, machines capable of carrying large numbers of passengers and operating much as the railroads do, on regular schedule between the larger cities and eventually between such smaller places.

In the second place, there will be developed smaller and faster planes, both for mail service, for quick transportation and for private use somewhat in the same way that the automobile is now used. Both of these lines of development may be expected to proceed together and to furnish between them a wide and flexible air service.

In the carrying of large numbers of passengers, the dirigible at present has a distinct advantage, largely for the psychological reason that people traveling by it feel safer than when traveling by aeroplane. The development of power plants and control systems for the big gas bags has been such that they are now substantially safe against any ordinary storm, and it will not be difficult to have enough landing places so that they can be absolutely safe. The construction of vessels of this type has, in fact, now reached a point where even very little development will put them on an entirely practical basis for the regular and economical transportation of considerable numbers of people.

The development of large aeroplanes is limited at present by our incomplete knowledge of plane structure. With any structure which has yet been devised, a point comes where the increase in the weight of the plane must be out of all proportion to the increased carrying capacity, and until this handicap is overcome, aeroplanes cannot exceed a very limited size.

At present it appears that they cannot be constructed economically to carry more than forty to fifty passengers, but we may expect to see planes of this capacity operating within a very short time. Further experiments with plane structure, with new materials for wing covering and particularly with all-metal planes may easily lead to a considerable increase in the limits of weight-carrying practicability.

The development of the smaller planes, which will follow somewhat the lines of use of the automobile, is a comparatively simple matter. We are already assured of the possibility of speeds around 200 miles an hour, and of whatever carrying capacity may seem desirable in the light planes. My own opinion is that the aeroplanes for private use are likely to approach the capacity of the modern touring car and handle something like six passengers, in addition to the pilot. These ought very shortly to be making regular non-stop trips of a thousand miles.

The limitations which have been imposed upon the development of commercial aviation by the lack of landing fields are being dissipated more rapidly than is generally realized. No complete census of such fields has been made for the United States, but a recent investigation of the state of Michigan alone showed 117 such fields. It is entirely safe to expect that within a very few years there will be no important town without one, and a great many individuals will have them for their own use.

In the matter of costs, aeroplanes will in due time become a form of transportation almost, if not quite, as economical as the automobile. There are aeroplanes to-day which carry six passengers at the rate of 100 miles an hour and make ten miles to the gallon of gasoline—a cost which is less than that of many automobiles of equal capacity. In fact, there is no automobile that at the same speed will show such fuel economy.

Two other factors are tremendously in favor of the aeroplane as an economical means of transportation, and it is merely a question of time when both begin to make themselves felt.

The first is the fact that the aeroplane requires no rails; not even a road to travel on. The hundreds of millions that have been needed to put down our great railway system, and the other hundreds of millions that must be spent very shortly in providing roads, are all unnecessary so far as the airship is concerned. Its only requirement is landing fields, and these can be easily and cheaply prepared and maintained.

The other saving in respect to aeroplanes is in tire cost and the bills which the automobile owner must pay to maintain his running gear. The saving in tire cost will be almost 100 per cent, since the aeroplane's wheels run for only a few hundred yards in taking off and in landing. Until recently the repair bills have been large because of the somewhat experimental character of the machines and lack of skill in landing. Both of these handicaps have been almost entirely eliminated.

The price of an aeroplane is at the present far beyond the reach of the average person, but this too will be changed within a short time. There are a number of aeroplanes to-day that can be produced by manufacturing methods like those which made the motor car so cheap, and there is little doubt that, as soon as the demand begins to increase, automotive manufacturers will achieve as great a triumph in producing cheap aeroplanes. As soon as the aeroplane is put upon a basis of standardized manufacturing it will immediately become a commercial possibility and will be within the reach of men who will use it, not for sport, but as a time saver and for ordinary transportation.

Of course the aeroplane will never supplant the automobile. It will fill a field which is beyond the reach of the motor car and will be another addition to the transportation equipment which makes modern civilization possible. It is a fact that no form of transportation ever invented has become entirely obsolete, while each new method increases the facility and economy of the transfer of people and goods. The aeroplane will very shortly have its place in this complicated system and will be able to perform many vital functions which have hitherto been impossible.

The immediate future development of the aeroplane will center about the plane structure rather than the engine. Developments in the design of power plants have made engines fireproof, practically trustworthy in operation and good for some 500 to 1000 flying hours, which means that they can cover somewhere between 25,000 and 50,000 miles each, a mileage comparable to all but the best automobiles.

Development of plane structure, however, presents wide opportunity. The Germans, through concentration on this point, were able to get speeds approaching those of the best allied planes from engines of considerably lower power. Attention is now being focused on the all-metal plane, and the attempt to build wings in which the bridge structure will be enclosed, thus reducing head resistance to a minimum, promises startling results.

Probably the most immediate opportunity for practical development of aeroplane service is in connection with the aerial mail of the Post Office Department. If the mail service is taken seriously and properly extended throughout the country, we may expect very definite and valuable results.

In the first place, there will appear promptly a greatly increased reliability, because in this service planes must fly on schedule time and failures would be brought forcibly to the attention of authorities. A greater cruising radius would also be evolved, since in the service it is desirable to fly for long distances without landing. Direct non-stop flights between New York and Chicago may be expected as one of the almost immediate developments. The cost of aeroplanes also would be gradually reduced because manufacturers would receive enough orders to permit them to "tool up" their factories and begin standardization quantity production.

Economical, reliable aircraft engines would be developed for this service and, because of the quantities required, it naturally follows that such engines would be obtained on short notice at a minimum cost. These engines could be developed so that they would be equally good for the mail service or for military purposes.

There would be a prompt improvement in instruments for aeroplanes such as are required for flying at night, in cloudy weather, etc. Finally the service would conserve the technical knowledge and expert artisans developed during the war and would increase technical knowledge and develop craftsmen. It would also provide a constant demand for good pilots,

with the result that we would always have a large number in training who would be immediately available in case of emergency.

It would also insure the construction of good landing fields in large numbers. Thus in many ways it would lay the foundations for the country-wide organization which will be necessary to put commercial aviation on a solid basis.

The military aspect of aviation must never be forgotten in considering this subject. Aeroplanes were vital in the last war and will be even more so in the next one. During the last war the government had no trouble in obtaining prompt delivery of passenger cars and trucks because such vehicles had been thoroughly developed and were being produced in quantities for other uses.

The aerial mail offers the best immediate possibility of bringing about the same condition in aeronautics. In the first place, it will make mail-carrying planes and pilots immediately available in cases of emergency. In the second place, it will bring about commercial use of aeroplanes, which in the final analysis is the real answer, since it will provide America with great fleets of planes and of dirigibles that will put us beyond danger in case of sudden trouble.

The present status of aeroplane development is in marked contrast to any stage in the evolution of our other transportation facilities. Instead of the gradual growth through which all the others have passed, the aeroplane, almost overnight, has developed most of the reliability and economy in operation that is necessary for everyday commercial use. The railway, the steamship and the automobile each went through a series of stages of progressive development, working up gradually from almost complete uselessness to the highly developed powers that they show to-day. They did this through more or less constant, unswerving growth toward our modern type. This has not been true, however, with the aeroplane and particularly with the aeroplane engine.

At the beginning of the World War, the aeroplane was little more than a scientific toy used occasionally as an instrument of sport. In the struggle for supremacy in the air, war requirements were paramount. High speed, height climbing, a fast rate of climb and ability to carry reasonably heavy loads were developed at the expense of every other feature, including that of safety. So rapid was the development that aeroplane types frequently became obsolete after only a few months of use.

With the end of the war, however, these wartime requirements gave way to such commercial requisites as comfort, economy, low operating and maintenance charges, low landing speeds, stability and a low rate of depreciation in the machine; in other words, mechanical endurance. The end of the war saw the aeroplane rather highly developed as an arm of warfare but by no means highly developed as a means of commercial transportation. Furthermore, all paraphernalia which had been invented during the war and which were essential to military uses of the aeroplane were obviously of little use in commercial aviation.

Flying fields had been established throughout the country for the training of pilots, but their location had been dictated rather by climatic conditions and military convenience than by their availability in commercial work and their accessibility to the large cities. These fields were mostly unsuitable as a basis for commercial air routes, since their location bore no particular relation to the main arteries of travel. If one of the fields happened to be well located for commercial purposes it was entirely an accident. As a result, shortly after the armistice many of these fields, which had been prepared at enormous expense to the government, were necessarily abandoned to their former owners or were sold outright.

The only respect in which this condition of unsuitability was not entirely true was in the development of engines. As a result of extensive experiment and careful checking of results, many types of engines had been developed which, through comparatively small modifications, could be made

the models for the manufacture of engines of high commercial efficiency.

As a result of development since the war, and even during the last months of the struggle, the time has long passed when it was considered a remarkable feat to operate an aeroplane engine 200 hours in the air without a major overhaul. This may easily mean a distance of some twenty thousand miles traversed, but there are quite a few makes of engines which are capable of such performances to-day.

Yet engine failure is still responsible for practically all the uncertainty that there is as to the carrying out of flight on a prearranged schedule. It is true that weather conditions have some bearing on the situation, but with the steady improvement in navigating instruments and methods and better cooperation with the various weather bureaus it is comparatively rarely that bad weather interferes with the completion of a flight.

To a large extent, the engine failures that are being recorded to-day are due to the fact that most of the engines in use are of the types developed during the war. The armistice left us with thousands of aeroplane engines on hand, and, although there has been improvement in construction and elimination of those defects which are the cause of lack of reliability, it is entirely natural that use should be made of the engines available rather than that the expense of building new and improved types should be incurred. For the scientific student of aviation, however, the important fact is that these improvements have been made and that aviation at present is far more advanced than the performances of a majority of aeroplanes to-day would indicate.

If we analyze the causes of engine failure, it will be found that almost invariably the trouble is due to some minor defect. Chief among these are such things as a stoppage of the fuel supply, a leak in the water, oil or gasoline system, a poor connection in an ignition wire, the accidental disconnection of some of the engine controls, or something of this kind.

In the early days of the automobile, nine-tenths of the roadside delays were due to very similar causes. These have now been almost entirely eliminated so far as the automobile is concerned and recent inventions indicate that the aeroplane engine has almost, if not quite, reached the same stage. In other words, the aeroplane engine to-day is a highly refined and very reliable mechanism. It is susceptible, of course, of considerable improvement in many respects, but it is nevertheless capable of giving continual service over long periods of time, provided, of course, there is a continuous supply of water, gasoline, oil and current for ignition. The failure of any of these essential accessories will cause a forced landing and it is these failures in the war type machines that are the causes of most of the trouble to-day.

The fire hazard presents the worst peril that confronts the occupants of a plane. A large number of recent aeroplane accidents have been due to this cause, and it is notable that in five out of eight Junker planes recently brought to this country and used by the Postal Air Service failure was due directly to this cause. But the latest types of engines, such as the eight-cylinder and the powerful Twin-Six motors now being manufactured by the Packard Company, have been designed in a way to eliminate any such possibility.

When we come to consider the basic engine design, there have been some fairly important improvements since the armistice which were largely the result of war experience. These are mostly applicable to commercial machines and they increase both the safety and reliability of the power plant.

Considerable attention is being paid at present to the development of supercharges which will maintain air pressure and permit flying at around 20,000 feet. There will naturally be considerable discussion of this subject, since flight at this altitude decreases the head resistance and would make possible higher speeds and lower operating costs.

These advantages are real, but it is my belief that the disadvantages involved in the long climb and the precautions which must be taken for the

comfort of the passengers and pilot in so rarefied an atmosphere offset the advantages to be gained, except in particular instances; so that there is not so much to be gained in operating efficiency as might be expected.

One more important innovation that has come in aviation since the war has been the use of electric starters. The cranking of an aeroplane engine by hand by means of its propeller has always been very dangerous, and it practically requires that an extra mechanic be available at all times.

The use of the electric starter brings the era of commercial flying perceptibly nearer, since it obviates one of the most annoying delays in starting a trip because cranking by hand frequently fails to start a balky engine, whereas the electric starter usually insures a prompt response.

Summing up the immediate future in aeroplane construction, it is clear that we have already reached a point where aeroplane engines can be constructed that will give all that can reasonably be demanded in safety and reliability. Within a very short time, the large supply of engines left over from the war construction will have vanished and a distinct spurt will follow the demonstrations of efficiency that will come when the improved engines appear upon the market. With this situation the most essential need for the development of commercial aviation will have been met, and there can be no doubt that a comparatively short period will see some such sudden utilization of aeroplanes as took place with automobiles as soon as those vehicles had ceased to be toys and had become trustworthy servants of mankind.—*Flying*, April, 1921.

ENGINEERING

DIESEL ELECTRIC DRIVE INSTALLATIONS POSSESS MANY POINTS OF SUPERIORITY.—That the Diesel electric drive is not only more reliable than a direct Diesel drive, but that the total fuel consumption for certain types of ships was slightly less and the overall weights considerably less, were statements made by Mr. J. B. Bassett, of the General Electric Company, in his lecture before the Ocean Marine Engineers Beneficial Association No. 80 in February. A number of detail tables showing the efficiencies, weights, costs and fuel consumption of these different types of drives were shown to prove the conclusions that have been arrived at.

Since Admiral Benson, chairman of the U. S. Shipping Board, first declared his intention of promoting the development of electric drive in connection with Diesel engines, there has been considerable interest shown by steamship companies and naval architects in this new type of ship propulsion machinery.

The general name Diesel electric drive is intended to cover any propelling equipment in which the power is developed by internal combustion engines and is transmitted to the propeller through electrical machinery. There are several arrangements that might be used with Diesel electric drive, but the one usually employed is that of series connected direct current equipments. The reason for this is that the speed of the engines permits direct current generators to be used and the control of the entire equipment is simpler and better.

While this type of drive has a number of advantages over the direct Diesel drive for cargo ships, it is of particular value on certain types of craft, such as ferries, tugs, yachts, fire boats, trawlers and canal barges as these are subjected to considerable maneuvering and considerable time is spent in "standing by." With the Diesel electric drive the propeller can be reversed quickly and continuously without reversing the main engine, while obtaining the full power ahead or astern on the propeller; also, the high fuel losses in keeping up steam while "standing by," as would be experienced on a reciprocating engined craft would not be obtained on a Diesel electric drive as the equipment can be started up cold in a few minutes. A number of such installations have already been made in this country on trawlers, yachts, auxiliary schooners, and fire boats and have proven entirely successful in all respects.

A comparison between a 3000 S. H. P. Diesel electric drive and a direct drive Diesel, as installed on a 8000 to 10,000-ton D. W. freighter shows that the former still has marked advantages, as with a direct Diesel drive it would be necessary, owing to the size, to divide the power, using two engines and two propellers, with the resulting low propeller efficiency as compared with a single screw. Also, the Diesel electric drive can be designed to run at the most efficient speed of the propeller, while a direct Diesel drive of that size would necessarily be operated at a high propeller speed, with a resulting loss of propeller efficiency. While the initial cost of the Diesel electric equipment would be little if any higher than the direct Diesel drive, the saving in weight would be about 33 per cent and the saving in overall fuel consumption almost 4 per cent, due to increased propelling efficiency. The large electrical manufacturers have received many requests for estimates on electrical equipment for Diesel electric drive for cargo ships and tankers in capacities up to 6500 H. P.

Advantages of Electric Drive with Diesel Engines.—Some of the advantages claimed for this type of drive are as follows:

1. Reliability: Several engines of small size instead of one or two large ones.
2. Space saving: Machinery space 25-30 per cent less due to small high speed engines.
3. Weight saving: Diesel electric weight 30 per cent less than direct drive weight.
4. Maneuvering ability: Propeller can be reversed rapidly and continuously.
5. Simple engines: Engines not reversed nor run at reduced speed; may be started electrically, simplifying valve and operating gear.
6. Bridge control: Duplicate control station can be located in the pilot house without additional complication.
7. No shaft tunnel: With engines amidships and motor in stern shafting and tunnels are eliminated—saves weight and gives undivided cargo space.
8. No propeller racing: Engines run at constant speed and motor speed varies less than 10 per cent in heavy weather.
9. Less auxiliaries: Only one auxiliary generating set required if any. With electric starting no starting air tanks or compressor required.
10. Flexibility: Efficient operation at all speeds—at reduced speed only enough engines need be operated to supply the required power.
11. Single screw: Single screw construction can be used, reducing hull cost and increasing propelling efficiency.
12. Special cases: Diesel electric drive has particular advantages in double ended ferries, tug boats, yachts, self-propelled barges, fishing trawlers, fire boats, submarines, etc.

Mr. Bassett presented a number of figures showing that in the case of the type of vessel selected for comparison, the weight of a Diesel direct drive engine would be 1,219,500 pounds as compared with 1,080,100 pounds for a Diesel electric drive equipment. The relative weight of engines was therefore as 1.00 is to 0.886. The total cost of a Diesel direct drive engine plant would be \$354,000 as against \$380,000 for a Diesel electric drive plant.

In the case of a Diesel drive, the total consumption per day would be 13.44 tons as against 12.94 tons when the other equipment was installed.—*The Nautical Gazette*, Apr. 2, 1921.

SOME EXPERIMENTS IN CONNECTION WITH THE INJECTION AND COMBUSTION OF FUEL-OIL IN DIESEL ENGINES.—Engr. Commander C. J. HAWKES, R. N. (*Northeast Coast Institution of Engineers and Shipbuilders*, November 26, 1920.)—This paper deals with experiments at the Admiralty Engineering Laboratory on the injection and combustion of fuel-oil in the Diesel engine.

With the air-injection system, a definite quantity of fuel-oil is pumped into the fuel-saving casing, and when the valve lifts, compressed air provided by a high-pressure air-compressor blows the oil into the cylinder in a finely divided state.

In the solid-injection system, no air-compressor is required. The fuel pump raises the oil throughout to a comparatively high pressure, and when the fuel valve lifts, the requisite quantity is forced by its own pressure through a number of small holes in the sprayer, being thus split up into a mist.

The experiments with the solid-injection system will be mentioned first, and subsequently some on the air-injection system.

It will not be possible in this abstract to do more than to give an idea of the nature of the experiments and some of Mr. Hawkes's conclusions therefrom.

Experiments on the Solid-Injection System.—For the experiments on the solid-injection system, use was made of a single-cylinder, four-stroke engine 14½" by 15", capable of developing 100 B. H. P. at 380 R. P. M.

An investigation was made to ascertain the cause of and the remedy for the sticking of the exhaust valve (the principal part of the remedy consisted in adding a deflector to protect the valve spindle from the rush of exhaust gases); another to determine the effects of the different numbers and sizes of holes in the sprayer. Most of the tests having been made under pressures, powers, and other conditions usual in such cases. It was found that under such conditions the best all-round results were obtained by the use of five 0.016-inch holes per sprayer.

Experiments were made to ascertain the effect of fitting steel plates to the top of the alloy piston, generally with the result of increasing the fuel consumption.

Others to find out whether this was due partly to some of the fuel-oil assuming the spheroidal state on striking the hot piston, thus delaying the vaporization and combustion.

At 4000 pounds per square inch pressure, however, the roller began to leave the cam, and better results were obtained by increasing the spring load up to 850 pounds, but no advantage was gained by increasing it further. Tests were made on the conditions that brought about "jumping" of the valve.

A study was made on the effect of the length of holes in the sprayer, and a comparison between the 0.016-inch and the 0.019-inch ones, at about 100, 90, 75, 50, and 25 B. H. P. He concludes that the proper number, size, and angle of holes in a sprayer depends upon the mean pressure, the viscosity, the mean indicated pressure, and the distance the jets have to penetrate into the combustion chamber; also on the speed of the engine. The determination of the number, size, and angle of the holes for a given engine, however, is largely a question of trial and error.

Many other experiments were made on the solid-injection system which will not be referred to here.

Air-Injection System.—A large number of very important tests were also made on the air-injection system, dealing with many important details, and so comprehensive that not only a great deal of valuable information can be obtained from them in regard to details, but also Mr. Hawkes is enabled to compare the two systems as to their advantages, disadvantages and idiosyncrasies.—*The Journal of the Franklin Institute*, April, 1921.

IMPROVING THE POWER-FACTOR OF INDUCTION MOTORS.—A method of improving the power-factor of induction motor circuits by causing the motors to run as synchronous motors after they have been run up to speed as ordinary induction motors is described by R. G. Warner and A. E. Knowlton.

Continuous current is supplied to the slip rings so that the motor simply becomes a revolving field magnet, which may be over-excited, if necessary, to improve the power-factor. This can either be done by means of an exciter on the shaft of the motor, or the necessary continuous current can be derived from the generating station or substation by an arrangement only involving one extra wire. The continuous current is passed through two of the phase windings of the rotor in series, while the other may be short-

circuited to give a damping effect. Satisfactory particulars of tests of a machine treated in this way are given. It is found that no sacrifice in the original rated capacity of the motor is entailed and no alteration to the motor windings is necessary. (*Electrical World*, Nov. 20, 1920.)—*The Technical Review*, Mch. 8, 1921.

MICHELL THRUST BLOCK AND JOURNAL BEARINGS.—As a result of tests the Admiralty fitted one shaft of a 40,000 s.h.p. destroyer with Michell journal bearings, the ordinary bearings being left on the other shaft for direct comparison. Taking the two low pressure turbines for comparison, each having spindles 9 inches in diameter, and running 1800 r.p.m. at full power, the projected areas of bearing surface were 94 and 20 square inches for ordinary and Michell respectively, and the corresponding loads 120 pounds and 540 pounds per square inch. The length of the bearing surface of the ordinary journal was $10\frac{1}{2}$ inches, and of the Michell journal $3\frac{3}{4}$ inches. Over two days' series of progressive trials the oil temperatures were carefully recorded, and the Michell bearing ran 18° cooler than the ordinary.

Particulars of wear after 15 months' running are given, and also of an ingenious modification in the thrust block by arranging for the edge of the single thrust collar to ride on Michell journal pads. This latter resulted in the thrust block running dead cold even at full speed. (J. Hamilton Gibson, M. Eng., Paper read before the Liverpool University Engineering Society. *Siren and Shipping*, Dec. 29, 1920.)—*The Technical Review*, Mch. 1, 1921.

WINGFIELD THRUST BLOCK.—The Power Plant Co., Ltd., have produced lately a new type of single collar thrust block, following in principle the lines of the Michell block, but differing from it considerably in details. In the Wingfield thrust block the pads are white metal lined and the tipping motion of pads is allowed by the provision of steel balls in guide cages, against which the pads press through the medium of a case-hardened ring. This type of thrust block is suitable either for forced lubrication or oil bath. (*Zeitschrift des Vereines deutscher Ingenieure*, Jan. 1, 1921.)—*The Technical Review*, Mch. 8, 1921.

MAGNETIC TESTING OF STEEL.—The name Defectoscope has been given to a new device for testing steel magnetically by the inventor, Dr. C. W. Burrows, of New York.

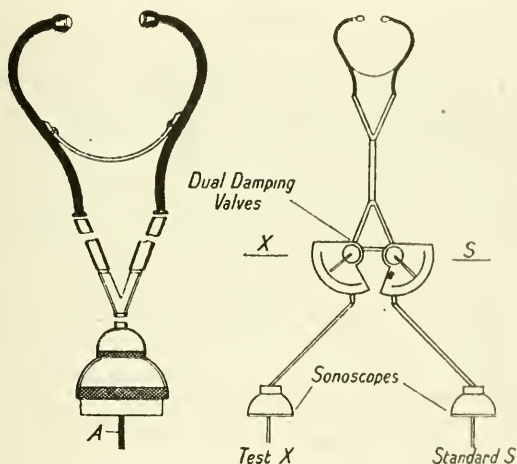
The instrument, which is said to be especially adapted for the determination of defects in steel wire, rods, rails, cables, and strips, consists essentially of the following six elements: (1) A solenoid energized by direct current to effect magnetization of the test piece. (2) A detector consisting of two test coils having the same number of turns and surrounding the specimen bar whose magnetic variations are to be determined. (3) A motor to impart a relative motion along the length of the test bar to the magnetizing solenoid and detector which are rigidly connected together. As the detector occupies different positions along the length of the specimen it is threaded by an induction depending upon the nature of the specimen. If it is not quite uniform, the magnetic induction threading one to the coils and the detector is different from the induction threading the other coil, with the result that the e.m.f. generated in one of the coils differs from that in the second test coil. Consequently, the small differential e.m.f. is impressed upon the detector system every time it passes over the magnetic inhomogeneity. (4) A heavily damped D'Arsonval galvanometer indicating the small e.m.f. developed in the detector coils. (5) A recorder which "reads" the galvanometer and is essentially a photographic film caused to move uniformly across a small slit through whose opening a spot of light is reflected by the galvanometer. (6) A control box containing all necessary electrical switches, rheostats, and instruments.

Magnetic testing being non-destructive of the material has the advantage of being applicable to every piece if necessary, but by the proper selection

of the characteristics to be measured a single determination—as to whether or not a test piece is of the same magnetic characteristics as an original standard sample—may be made to settle the question.

The Defectoscope, as adapted to the testing of rails, rods, wire, cable, ribbon steel, etc., is described for each individual case, with accompanying illustrations of apparatus. Some notes as to work already done with the instrument and an outline of its future scope are given. (*Iron Age*, Oct. 28, 1920.)—*The Technical Review*, Mch. 1, 1921.

THE SONOSCOPE.—An instrument known as a Sonoscope, and intended for ascertaining the exact positions of defects in internal-combustion engines and other machines, has recently been put upon the market by the Capac Company, Limited, of 2, Woodstock-street, Oxford-street, W. 1. In its simplest form the instrument consists of a small circular case containing a diaphragm to which a metal test rod *A* is attached, as shown in the left-hand drawing in the accompanying engraving. The upper part of



the case is fitted with flexible ear-pieces, so that by placing the test rod *A* on engine-cylinders, gear-boxes, etc., internal noises can be heard, and by shifting the test rod into different positions, and noting the point at which the sound is most pronounced, the position of a fault, such as a slack bearing or a broken or worn part, can be determined. The nature of the sound and the operator's knowledge of the construction naturally give a clue to which part of the mechanism is at fault. The makers direct attention to the fact that whereas under ordinary conditions external sounds make the detection of the exact cause of knocks, etc., difficult, with the Sonoscope only the sound of the particular part to which the instrument is applied is conveyed to the ear, and such defects as piston slap, loose bearings, incorrect valve tappet clearances, etc., can be detected with certainty. Tests on motor car engines gear boxes, etc., can be made whilst cars are running on the road by attaching the instrument to the part under observation and by connecting it up to ear pieces.

Another application of the system is in connection with the comparison of sounds. It involves the use of two sonoscopes, which may be arranged as shown on the right of the engraving, the testing rod of one sonoscope, as indicated at *X*, being placed upon the arrangement to be tested, and the other rod, indicated at *S*, upon a special device which produces a predetermined amount of sound. The standard sound-producing apparatus may be

driven by clockwork, and in order to avoid confusion it is designed to give a different kind of sound to that of the mechanism under test. In each of the sonoscope pipes leading to the ear pieces is a damping valve, and with each of the valves wide open the standard sound at *S* must exceed that at *X*. If the sound *X* exceed the sound *S*, then the part being tested is rejected. If, however, the valve *S* has to be partially closed, in order that the sound *X* may be heard, the noise made by the mechanism under test is obviously less than that of the standard mechanism. Conversely, if the valve *X* has to be damped in order to hear the sound at *S*, the sound *X* is greater than the standard.

Another type of instrument is also made. In it the two sonoscopes are quite independent, and are connected to separate ear pieces, but this instrument usually requires a certain amount of practice before the operator becomes proficient in its use, and the arrangement shown on the right of the illustration is, the makers explain, in many cases preferable.—*The Engineer*, Mch. 18, 1921.

ORDNANCE

DISPERSION OF PROJECTILES.—Investigations recently carried on as to the dispersion of projectiles, including experiments at Aberdeen Proving Ground, Md., have shown that the dispersion of field high explosive projectiles ranging in caliber from 75-mm. to 8-inch., is mainly due to the behavior of the projectile in the part of the trajectory near the gun. It had previously been shown that as the projectile leaves the gun it executes a series of periodic swings similar to the swing of a clock pendulum; the plane in which the swing occurs rotates uniformly; amplitude of the swing in the case of some service projectiles is as great as eight degrees on either side of the trajectory, but it varies considerably from round to round. As the projectile reaches greater distances from the gun, the character of the motion changes from that of swinging back and forth across the trajectory to a type of motion in which the projectile swings or precesses around the trajectory; amplitude of motion decreases until about a mile from a 75-mm. gun the projectile is travelling almost nose on. Resistance of such a swinging projectile is considerably greater than that of one travelling nose on, depending on amplitude of the swing. Consequently a projectile having a large swing near the gun will lose more velocity and have a shorter range. The dispersion, especially at high elevations of the gun, is due mainly to this effect.

In the light of this, the general problem of designing accurate projectiles depends upon three factors: Effects of design of the projectile and twist of rifling upon amplitude of initial swing; effect of shape of projectile on increase of resistance caused by the swinging motion; rate at which the swing dies out as depending on design of the projectile. Considerable progress has already been made in investigation of the first and third factors, and a new chronograph is being installed at Aberdeen for investigations with regard to the second factor, *i. e.*, increase in resistance due to the swinging motion. It has been possible to make comparatively accurate predictions of the relative dispersion of the same design of projectile when fired in guns of different twists of rifling. It is expected that when investigations now under way have been extended, it will be possible to predict approximately the amount of dispersion of a given type of projectile in a given gun before it has been fired. For example, if it were desired to design a projectile and rifling for a 100-mile gun, it should be possible to predict what proportion of the shots would land within a two-mile circle a hundred miles away from the gun. (*Army and Navy Journal*, Feb. 5, 1921.)—*The Technical Review*, Mch. 8, 1921.

DECOPPERING OF GUNS.—The possibility of the removal of copper from the lands and grooves of cannon, by the use of a tin-lead alloy introduced

into the powder charge—which was developed and used to a limited extent by the Allied armies during the war—has been recently tried out by the U. S. ordnance authorities in a 16-inch 35-caliber gun, with most satisfactory results. The gun in question had been fired about 150 rounds, and a heavy coating of copper of a granular form had accumulated, both on the lands and in the grooves; 20 rounds were fired as rapidly as possible, in which 450 grams of the alloy were introduced between the front end of the powder bag and the base of the projectile. The results shown by a visual inspection are that practically all of this accumulation of copper has been removed, and that remaining is in the form of a smooth plating. The alloy apparently caused no change in the muzzle velocity or range of this gun, and the final 10 rounds showed a marked improvement in deviation. The alloy used consisted of 60 per cent tin and 40 per cent lead, and was rolled into strips $1\frac{1}{2}$ inches broad, 50 inches long, and weighing 20 grams each. (*Field Artillery Journal*, Nov.-Dec., 1920.)—*The Technical Review*, Mch. 1, 1921.

RESEARCH ON ELASTICITY.—Evidence accumulated tending to render doubtful the effective value of the hypotheses upon which the science of elasticity is established, particularly in their application to practice, an extensive programme of experimental work has been undertaken by the U. S. ordnance authorities. The investigations comprise tensile and compressive tests of gun steels, and photo-micrographic studies of the structure of the material before and after application of stress; tests with combined stresses applied hydraulically to the specimen; tests of hollow cylinders stressed by internal hydraulic pressure. The cylinder tests will aim at obtaining data applicable to autofrettage work. Tests with compound cylinders will also be made to obtain data on shrinkage processes. (*Field Artillery Journal*, Nov.-Dec., 1920.)—*The Technical Review*, Feb. 22, 1921.

WAR GASES.—It has been shown that “mustard gas” is not toxic in itself, but that it penetrates the cell readily, owing to its high lipid solubility. It is then hydrolysed inside the cell, setting free hydrochloric acid, which is the real destructive agent. Hydrochloric acid itself does not penetrate the cell walls readily, and the function of the mustard gas is, therefore, to provide for an intracellular liberation of the hydrochloric acid. According to this hypothesis, the important factors in determining the action of mustard gas, or of any other gas which acts similarly, are the lipid solubility, the water solubility, the volatility, and the rate of hydrolysis.

If a substance hydrolyses practically instantaneously, as is the case with arsenic trichloride, there is no chance of the hydrochloric acid passing through the skin. If a substance is very volatile a good deal of it may evaporate from the skin before it has time to penetrate. If a substance does not penetrate the skin or the cell wall, no hydrochloric acid can be set free inside the cell, and we shall not get the effects characteristic of hydrochloric acid inside the cell. Phosgene, for instance, is very volatile, and does not penetrate the skin readily, and consequently does not produce burns. The more unprotected the tissue the more easily will phosgene pass through, and consequently we get the maximum effect from phosgene at the base of the lungs where the tissues are the most permeable. On the other hand, mustard gas is not very volatile, and passes fairly readily through the skin. Consequently it causes burns. Owing to the readiness with which it passes into the tissues, it is taken up in the throat and the upper part of the lungs, causing burns there rather than farther down, as is the case with phosgene. This is undoubtedly the reason why a man gassed with mustard gas loses his voice temporarily. Owing to the low rate of hydrolysis, a low concentration of mustard gas may be swept out of the tissues at the base of the lungs by the blood stream before any

appreciable hydrolysis takes place. This factor accentuates the difference between mustard gas and phosgene.

A substance with intermediate properties will, however, show some of the characteristics of mustard gas and of phosgene. This is true with phenyldichlorarsine and ethyldichlorarsine, both of which have low vapor pressures, fairly high rates of hydrolysis, and high lipoid solubility. They, therefore, attack the skin and upper respiratory tract as does mustard gas, and also cause profuse edema in the lower respiratory tract, as do phosgene and superpalite. Of course, the arsenicals may also have a specific toxic effect due to the arsenic content, but there is no danger of confusing this with the effect due to hydrochloric acid.

While the behavior of phosgene, mustard gas, and phenyldichlorarsine is what it should be, superpalite is more toxic than one would expect from its known rate of hydrolysis, and it is possible that there may be an intermediate formation of phosgene. We do not know at all why the tear gases act as they do, and any hypothesis will have to account for the two facts that in general the bromine compounds are more lachrymatory than the corresponding chlorine compounds, and that one particular compound is as effective as any bromine compound. Since this chlorine compound is extraordinarily persistent, it does not seem probable that any ordinary hydrolysis can be involved. (*Journal of Industrial and Engineering Chemistry*, Sept., 1920.)—*The Technical Review*, Feb. 22, 1921.

RADIO

WIRELESS IN PRINT.—A recent development in wireless telegraphy is the automatic printing of messages in Roman type. A demonstration given recently by A. A. Campbell Swinton to the Royal Society of Arts, in London, reminds a contributor to *Discovery* (London) that in January, 1914, Mr. Swinton suggested that before long we might have a telegraph-printing-machine operated by wireless "in every house, telling the latest news to all the nation, as also to the newspapers, should any of these continue to survive the competition of this much more rapid method of disseminating intelligence." That is,

"He thought, in other words, that it would soon be practical to operate 'wirelessly' the telegraph-printing-machines which for years have been familiar occupants of London clubs and hotels. It is clear that if this could be done there would be a great saving not only in first cost and in expense of upkeep, but also because there would be no practical limit to the number of stations that could receive signals simultaneously from a single sending-station, so that it would cost no more to send to a thousand stations than to one. To some such an idea of the universal distribution of news might at the time have appeared fantastic, and may do so even now, but, at any rate, for an area comprising the British Isles and western Europe it is now a possible thing.

"It is well known that instruments connected to telegraph wires for printing messages are in daily use in newspaper offices and elsewhere. It is also well known that wireless messages can be recorded, in various optical and mechanical ways, and even by an instrument analogous to a phonograph, but the ingenious method designed by Mr. F. G. Creed is the first to be adapted to printing wireless messages.

"Suppose a message be telegraphed from London to a newspaper office in Sheffield. It is sent out of course in the ordinary Morse code of dots and dashes; these dots and dashes may be recorded by an instrument (the receiver) at Sheffield, which receives them by punching small holes in a moving strip of paper, this being simply one of several ways in which telegraphic messages are received. The strip of paper may next be passed through a second machine (the printer), which is really a typewriter controlled in an ingenious way entirely by the position of the holes in the perforated strip. In this machine the holes in the paper constituting

the dots and dashes of, say the letter F, operate a lever which causes the letter F of the typewriter to fall on a second strip of paper so that the letter is printed in Roman type. In this way all the letters and spacings in their Morse code form are translated into letters and spacings in Roman type, and so it is that a message sent out in Morse code from one town is received printed in words at another.

"Fig. 1 will help to make this clear. The very small holes along the center of the strip of paper are merely for the purpose of insuring the regular motion of the strip through the instruments and have nothing to do with the signals which are denoted by the large holes.

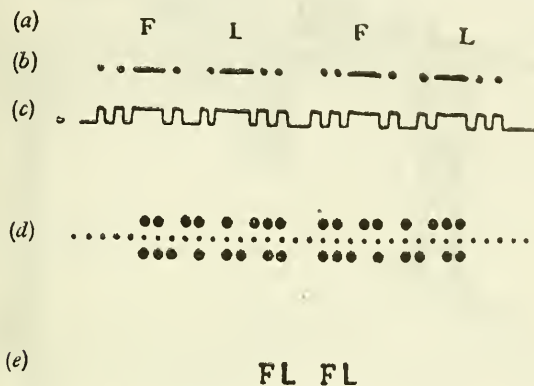


FIG. 1.—Wireless Printing in Successive Stages.

(a) Letters in ordinary type. (b) Dots and dashes in Morse code as represented in the usual way. (c) The same "dots" and "dashes" recorded on a strip of paper. (d) The same signals punched on a strip of paper by the Creed receiver. (e) The letters printed by the Creed printer from the strip of paper above it.

"It will be seen by comparison with the Morse signals (b) or (c) that a dot is denoted by two holes vertically over one another; a dash by two corresponding holes inclined to one another.

"Fig. 2 shows a photograph of the complete Creed receiving apparatus. In brief, the working is as follows: The message to be sent is first translated into Morse code by punching a perforated strip of paper in an apparatus with a typewriter keyboard. The message is now in the form (d) of Fig. 1. This paper strip is next passed through the transmitting instrument, which sends out impulses of electric current in the dots and dashes of the Morse code. These impulses actuate a special sending contact-maker which sends out the wireless waves.

"At the receiving end the waves are picked up by a thermionic-valve receiver. Their effect is amplified by an ingenious arrangement of valves. Impulses of current are thus supplied to part of the receiving apparatus known as the perforator. This is at present worked by compressed air, and is so designed that it punches on a moving strip of paper a duplicate of the arrangement of holes representing the dots and dashes which was used at the sending station for transmitting the message. When this is done the hard work is all over. It is then a comparatively simple matter to translate the Morse code message into Roman letters with an instrument similar to the one used for several years in a newspaper office."

At the meeting at which Mr. Swinton demonstrated the Creed apparatus he picked up a message sent out by Horsea, near Plymouth, printed it in Roman type, and projected it by a lantern on the screen. Later a special

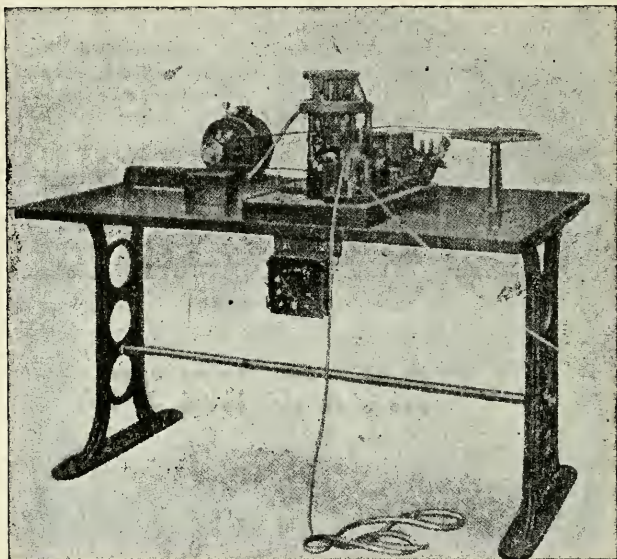


FIG. 2.—The Creed Wireless Receiver and Printer.

message was sent by wireless from Eiffel Tower. A facsimile reproduction of portion of this message as automatically printed is given in Fig. 3. To quote further :

FROM THE EIFFEL TOWER PARIS
RECORDED ON A CREED TYPE-PRINTING
RECEIVER AT A MEETING
OF THE ROYAL SOCIETY OF ARTS

FIG. 3.—A Message Printed by Wireless.

“The manufacturers are at present developing an improved form of printer in which compressed air is dispensed with. The present apparatus as adapted to wireless reception is capable of a speed of transmission of 180 words a minute, which is greater than that of the printer. The improved printer, however, will be capable easily of keeping up with the receiver.”—*The Literary Digest*.

RADIO CONTROLLED TORPEDO BOAT TO BE CONSTRUCTED.—The U. S. Government has, after several months' debate, decided to construct a Hammond radio controlled torpedo boat for practical test of the radio controlled principle, and the new vessel if built as designed will be propelled by a gasoline engine of 1600 horsepower.

The torpedo, which will be installed in the bow of the new vessel, will contain 1500 pounds of high explosives, and will, of course, be controlled in its movements from the shore.

The total cost of the new craft will be about \$373,000, divided as follows: Engines and gear, \$170,000; hull and accessories, \$100,000; radio dynamic features, \$45,000; auxiliaries and tests, \$58,000. The speed of the little vessel will be about 35 nautical miles per hour.—*The Aerial Age Weekly*, Mch. 28, 1921.

MISCELLANEOUS

"BREMEN'S" FATE REVEALED.—The fate of the *Bremen*, the second German commercial submarine to be constructed for undersea trade between Germany and the United States, and which never appeared in any American port after departing on her maiden voyage, has been at last revealed. In the recent annual report of the North German Lloyd it is stated that the vessel was lost on her first trip to New York with her entire crew of 28 men. According to the same report, the *Deutschland*, the original commercial submarine, made only two round trips between Germany and American ports.—*The Nautical Gazette*, March 26, 1921.

EFFECTS OF ELECTRIC SHOCK ON THE HUMAN SYSTEM.—The danger to life of an electric shock consists in the fact that it affects the muscles of the heart, stopping the heart's action.

The current, which, when passing through the heart muscles, will give a fatal shock to a person in normal health, is about 0.1 ampere; the voltage necessary to cause this current to flow depends naturally on the resistance, thus mainly upon conditions of contact. Even 110 volts has been known to give a fatal shock when the surfaces of contact have been large and moist. Contact with two hands is less dangerous than that between, say, the left hand and the right foot, as in the former case the heart is not in the direct line of flow of the current. Persons with heart ailments are likewise more susceptible to fatal shock than healthy persons. Horses are incidentally more liable to fatal shock than human beings. The effects of alternating current at the usual commercial frequencies (40/50) are more severe than those of direct current, but at very high frequencies (say 4000/8000) the nerves cease to react, and electricity at such frequencies is therefore not dangerous to life, which fact is taken advantage of in medical apparatus. Serious burns are more frequently a consequence of d.c. than of a.c. shock. Experiments in America with the electric chair have proved that if a person is expecting the shock a much more severe one can be resisted.

The treatment for electric shock cases is, as is well known, to endeavor to restore the suspended action of the heart by artificial respiration. The effects of electric shock, if not immediately fatal, seldom last longer than a few hours, apart from incidental burns. (A. Finsler, *Elektroindustrie*, Oct. 1, 1929.)—*The Technical Review*, March 1, 1921.

A BRITISH SPY AMONG THE BOLSHEVIKI.—Terrorism, torture, and violent death played a large part in the every-day life of the Russian communities that Sir Paul Dukes, a British spy, has lately returned from investigating. Nevertheless, so firmly is the iron hand of the Soviet Government fastened upon the lives of the Russian people, he says, that the stability of the present régime may be compared to the terror-enforced stability under the Czars. It is with this government that Great Britain has lately decided to resume

COMPARISON OF LATEST DESIGN IN CAPITAL SHIPS

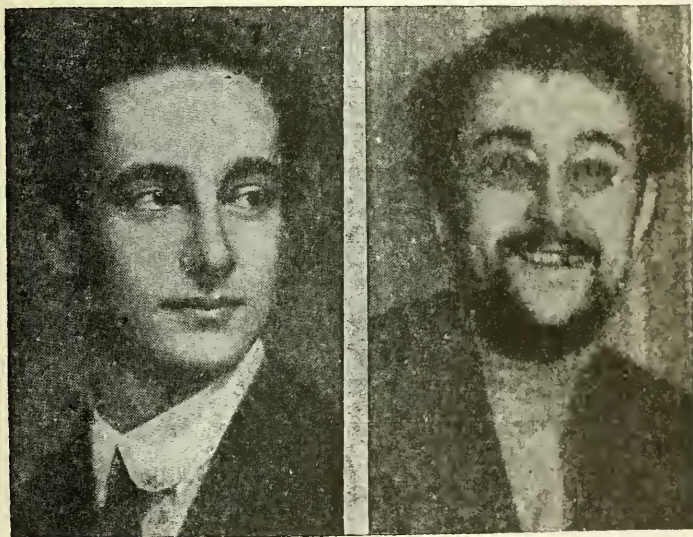
	Battleships			Battle-cruisers		
	U. S. S. Indiana	H. I. J. M. S. Nagato	H. M. S. Royal Sovereign	U. S. S. Lexington.	H. I. J. M. S. Amagi.†	H. M. S. Hood
Laid down.....	1920	1917	1914	1920	1920	1916
Launched.....	1922	1919	1915	1922	1922	1918
Length overall, feet.....	684	700	624½	874	850	869
Breadth extreme, feet....	105	95	88½*	105 ft. 5½ in.	102	104
Mean draught, feet	33	30	27	31	.....	28½
Normal displacement, tons.	43,200	33,800	25,750	43,500	43,500	41,200
Designed horse-power.....	60,000	46,000	40,000	180,000	170,000	144,000
Designed speed, knots.....	23	23	23	33½	33	31
Armament	12-16-in. 56-cal. 16-6-in. 53-cal. 4-3-in. A. A. 2 torpedo tubes.	8-16-in. 45-cal. 20-5-5-in. 50-cal. 4-3-in. A. A. 8 torpedo tubes.	8-15-in. 42-cal. 16-6-in. 50-cal. 2-3-in. A. A. 4 torpedo tubes.	8-16-in. 50-cal. 16-6-in. 53-cal. 4-3-in. A. A. 8 torpedo tubes.	8-16-in. 50-cal. 20-5-5-in. 50-cal. 8 torpedo tubes.	8-15-in. 45-cal. 12-5-5-in. 50-cal. 4-4-in. A. A. 6 torpedo tubes.
Protection	16-in. belt. 18-9-in. barbettes. 4-in. (?) deck.	12-in. belt. 14-in. barbettes. 3½-in. protective deck.	13-in. belt. 10-13-in. barbettes. 2-4-in. protective decks.	5-in. (?) belt. Bulges.	12-in. belt. Bulges.	12-in. belt- 11-15-in. barbettes. 13-in.-3-in. protective deck, bulges.
Weight of broadside (main armament only), pounds.	25,000	17,000 (approx.)	15,200 (approx.)	16,800	17,000 (approx.)	15,200 (approx.)
Cost complete.....	£8,000,000	£7,500,000	£3,000,000	£8,500,000 to £9,000,000	£10,000,000	£6,025,000

* In three later ships of this class, *Kamillies*, *Resolution*, *Revenge*, extreme breadth has been increased to about 102½ ft. by addition of bulges.
† All details of *Amagi* are unofficial, and, having been compiled from Japanese Press reports, must be accepted with reserve.

—*Engineering*, March 4, 1921.

business relations, and it seems not improbable that Dukes's report had something to do with that decision. He brings back to the civilized world a sharp reminder, however, that even though the world decides to do business with Russia under the tyranny of the Soviets as it formerly was glad to do when the country was under the tyranny of the Czars, the nature of the Bolshevik Government remains much the same.

"One of the most fascinating chapters in the history of the Russian Revolution," a writer in the *New York Tribune* calls the adventures of Dukes. The young Englishman, still only in his thirties and but lately knighted in recognition of his services to the British Government, lived for 18 months in Petrograd, Moscow, and other Russian centers, posed as an official of the Extraordinary Commission, worked in a munitions-factory, joined the "Red" army, and ran an extensive intelligence service for his government. The *Tribune* writer, Joseph Shaplen, who interviewed Dukes



Courtesy of the New York Tribune

AS HIMSELF AND AS A CHEERFUL BOLSHEVIK.

Sir Paul Dukes, of the British Secret Service, spent much time in intimate association with the present rulers of Russia, in spite of an official recommendation that he be shot on sight. The missing tooth, conspicuous in his Bolshevik make-up, could be replaced whenever he needed to change his looks.

on his recent visit to New York, gives some of his general credentials as follows:

Dukes has been outlawed by the Bolshevik Government, and the agents of the notorious Extraordinary Commission, maddened by their inability to effect his capture, have finally issued a decree permitting any Russian citizen catching Dukes on Soviet territory to shoot him on the spot. He was accused by the Bolshevik authorities of being personally responsible for many disorders and uprisings in Soviet Russia and of being the

head of the counter-revolutionary conspiracies which have given the Bolsheviks so much trouble within the last two years.

Dukes denies emphatically that he ever engaged in any conspiracies against the Bolshevik Government and says that his entire activity in Russia was confined to gathering information.

A member of a distinguished British family, Dukes was virtually brought up in Russia. He lived there for 12 years, studied at one of the Russian universities, and after a course in the Petrograd Conservatoire became assistant to the director of the celebrated Marinsky Theater. He speaks and writes Russian fluently.

After the outbreak of the war in 1914, Dukes was appointed a member of the Anglo-Russian commission and served with great credit during the war. On the outbreak of the revolution in 1917, Dukes, who had close connections with revolutionary circles in the Russian capital, joined the rebellion and participated in the street-fighting which resulted in the overthrow of the Czar.

Bitterly opposed to the Bolsheviks and regarding them as the real counter-revolutionists, Dukes volunteered to go into Soviet Russia in November, 1918, after he had already left the country, and take charge of the British Intelligence Service. This was soon after the murder of Captain Cromie, the naval attaché of the British Embassy in Petrograd, by the Bolsheviks. His offer was accepted by the authorities in London.

Dukes entered Russia by way of the Finnish frontier in November, 1918. He found many Russians of all qualities, from high officials in the government and officers in the army to boarding-house keepers and munitions-workers, who believed as he did about the Bolsheviks and were glad to help him. A friend and colleague of his was captured and shot. Dukes himself had enough hairbreadth escapes to fit out several movie dramas. These paragraphs, headed "An Expert at Fits," throw a sidelight on his cleverness at escaping detection:

"In an emergency I sometimes produced a 'fit.' I practised 'fits' and became quite expert.

"On one occasion, overtaken by a search, I had such a 'fit' that the investigator from *Gorochovaya Dva* (Extraordinary Commission), who was conducting operations, would not have let his men touch me with a ten-foot pole. My host was arrested on the charge of having had an interview with an Englishman masquerading as a Russian three months before. I often wondered what the investigator would have said had he been told subsequently that while he was searching the study the 'Englishman' was in the next room burning a couple of passports with different names, but with the same photographs, and hiding the ashes up the chimney.

"A brazen show of self-confidence was the best security at such moments. The person just mentioned as arrested on my account got off a few days later by an extraordinary display of audacity, outwitting even *Gorochovaya Dva*. I confess I am not one of those who love to plunge into any hazardous enterprise just for the fun of it. In many a tight corner I was really shaking in my boots, although I managed to keep those articles firmly on the ground and maintain an attitude of self-possession. A laugh at such moments serves well. A look of imbecility is at times an aid, too.

"I once entered a house the door of which was unguarded, intending to let myself in by a key to a flat on the first floor. In the hall I heard a curious commotion and jingling of keys just above. I knew the flat was empty and realized at once that a search was on. I tiptoed out of that hall about as quickly as I ever tiptoed in my life. But the floor tiling was loose and rattled. A pair of heavy boots came charging down the stairs after me like a ton of bricks, and just as I emerged into the street a big, brutal-looking fellow held me up with a revolver.

"'Stop!' he shouted. 'Whom do you want?'

"I looked up innocently at the lintel.

"‘Ah!’ I said, ‘all right. This, I see, is No. 19. I am looking for No. 17.’

"My long, straggling hair, shaggy beard, blue spectacles, and face contorted in a nervous grin must have given me the appearance of an utter imbecile. I limped off like a cripple. The man glared at me very hard, lowered his revolver, and let me go."

A great deal of his time was devoted by Dukes to the study of the machinery and operation of the Extraordinary Commission. He found conditions as to terrorism rather worse than they had been under the Czar. "Investigators" are everywhere, we are told.

The general public class these investigators quite simply as good or bad, the first being those who are human enough to take a bribe and let their victim go, and the second being those who show no mercy. When any one is arrested the first thing his friends do is to find out which investigator is entrusted with the case. If he is of the second class hope is given up at once. If the investigator in question is found to be "good" the victim is considered lucky, and means are taken to find out what the investigator's price is. The usual procedure of such an investigator is to put the victim through the usual interrogation, but ask only such questions as the victim is certain to answer satisfactorily. The investigator then reports to the council that he had found no incriminating evidence, and it is up to the council to render the final verdict.

In case the authorities feel that the victim was really guilty of acts of "counter-revolution," methods of torture are applied to elicit the desired information. Dukes is quoted:

"When I was in the Communist party I made the acquaintance of a commissar who boasted of his connection with *Gorochovaya Dva*, where he was an investigator. Two of my assistants, having obtained a bottle of vodka one day, got him drunk and persuaded him to tell some of the methods of the *Gorochovaya Dva*. He said that in case the authorities felt that a victim was concealing something from them they would apply methods of torture. The torture consisted in the rapid and consistent firing of revolvers in the vicinity of the place of interrogation, the feeding of a prisoner for days on nothing but salt herrings, but refusing to give him water to drink, flogging, and the application of red-hot needles to the quick of the fingers.

"‘It got on my nerves,’ said this Communist testily, ‘so I gave up that job and became a professional agitator.’

"It was as a professional agitator that I knew this neophyte of Bolshevism.

"During strikes the Extraordinary Commission sends agents into the factories to detect the strike leaders, and at election time a strict watch is kept upon the workers to mark such as do not vote for the Communist candidates."

Dukes was present as an invited guest at a special meeting of the Petrograd Soviet. The attitude taken toward the anti-Bolsheviks, the few who managed to get into the Assembly, is indicated, we are told, by this quotation from a speech made by Zinovieff, the president:

"Attempts have been made," he proceeded, "to stop work in the factories. Spies of the Entente and other 'White' Guard agents have penetrated to the workshops and misled a number of men, but we will root them out. We will suppress mercilessly every effort to discredit the Soviet power.

"To-day there have been two meetings in this hall at both of which resolutions were passed to support the Soviet Government. I know," continued Zinovieff, addressing the non-party members, "that among you there are quite a number of blackguards, Mensheviks, and Socialist Revolutionists, but don't fear, we shall find you and shoot you. It is perhaps a good thing you have got into the Soviet, for we shall catch you easier. We are willing to work with you, if you will stand by the Soviet Government, but say straight out, Are you for us or against us?"

The "Red" army is now, says the ex-spy, in very much the same state of morale as when, at the outbreak of the Bolshevik revolution, everybody decided to go home and leave the Germans in possession of the field. "They want to go home. That's all. They don't care what happens," Dukes is quoted. "They just want to go home and till the land." There's one great difference, however. At that earlier time, desertion was encouraged by the Bolsheviks. "This time there is iron discipline and merciless terror to hold them back." The story of the British spy's enlistment in the army, as told by himself, has a touch of humor mixed in with the tragedy and misery that he found:

"At the beginning of May, 1919, I enlisted as a volunteer in a regiment of a friend of the manager of my works, who, although strongly opposed to the Bolsheviks, gained their favor by blowing up the wrong bridges when Yudenitch advanced on Petrograd. My commander intended to blow up the retreat of the 'Reds,' but by an error blew up the retreat of their opponents. Thinking that he had done so purposely, the Communists extended to him an invitation to join the Communist party and gave him a command. As a private in this regiment, stationed close to the Polish lines, my commander delegated me to Moscow and Petrograd in various duties, such as purchase of books, motor tires, etc.

"When I traveled to Moscow as a 'Red' soldier, I traveled in state. Thus, in making frequent trips to Moscow and Petrograd—and my commander saw to it that they be as frequent as possible—I was able to obtain valuable information bearing on the army at the important official sources and to gather such information on conditions in general as I thought interesting and valuable.

"Once my commander sent me to Moscow to obtain a complete set of Bolshevik decrees for the year 1919 to be used for propaganda purposes in the army. The request was genuine enough, but I obtained two sets of the decrees, one for the army and another for the Foreign Office in London. When arriving in Moscow I always reported to the political division of the general staff, and was immediately assigned to good quarters. Usually, they would billet me in a room in the house or flat of some *bourgeois* family. The latter did not relish very much the presence of an unbidden stranger in their house, and I certainly did not like to impose on them, but I had to play the game.

"While in the 'Red' army I made detailed observations of the organization. In 1918, the first so-called 'Red' army was nothing more than a disorderly rabble, officered by such as incited the soldiers to the destruction of anything and everything that could be termed *bourgeois* and capitalistic. But as soon as the counter-revolution of Krassnoff, Deniken, and others commenced, Trotzky realized immediately that an efficient army with trained officers was necessary. At the present a very large number of former and influential officers of the Czar are serving the Bolsheviks, the majority of them doing so under compulsion.

"The first means taken to enforce compulsory service by Czarist officers was a declaration which every officer was compelled to sign, stating that he was aware that in case of his infidelity to the Soviet Government his wife, child and other relatives would be deported to concentration camps. This threat was an exceedingly potent factor.

"Terror, however, was not the only means utilized. As the Soviet Government realized the necessity of experts it changed its attitude toward that class. Despite the inclination of the lower Soviet officials to treat the officers and experts in the usual style—that is, jail them, kill them, and starve them—Lenine and Trotzky endeavored to conciliate this class and addressed them in a tone of consideration. These are the conditions which prompt officers to serve in the army:

- "1. Restoration of iron discipline and absolutist military authority.
- "2. Disappointment at the effects of Allied intervention.
- "3. Superior rations and pay.

" 4. Respect shown for officers by Lenin and Trotsky.

" 5. Protection of families and relatives from Bolshevik terror.

" The lower ranks of the officers are composed largely of 'Red' cadets. On the whole, these are strong supporters of the Bolshevik régime, but are mostly ignorant.

" The rank and file of the army is kept in line by terroristic measures and constant propaganda. The necessity of conducting constant propaganda in the army is the best indication of how strongly 'Red' the 'Red' Army really is. It is composed—80 per cent of it—of peasants, whose attitude to-day is very similar to the attitude of the Russian Army on the eve of the Bolshevik revolution. They want to go home. That's all. They don't care what happens. They just want to go home and till the land. Only this time there is iron discipline and merciless terror to hold them back. Despite these, however, the number of deserters is growing enormously. Relatives of the deserters, however, whenever possible, are taken as hostages and held until the delinquents return. There are special Communist 'cells' in every military unit whose duty it is to spy on the rest of the soldiers and report all conversations. These cells also act as agents of propaganda. Russia is deluged with propaganda, and it certainly does not speak very much for the Bolshevik régime if despite this huge propaganda the Bolshevik party has been unable to rally more than 500,000 members out of a population of 130,000,000 under Soviet control."

Dukes came out of Russia by way of the frontiers of Russia, Latvia, and Esthonia, "which countries are divided, at the point in question, by a number of lakes, surrounded by huge marshes marked on the map as impassable." A cavalry guard chased him and two companions into a swamp, through which they waded for hours, along the shores of a lake. Suddenly, however, he writes:

"We hit upon a piece of good luck, when to our great delight we found a castaway fishing-boat in the marshes. It was a shabby old thing, and it leaked badly, but on examination it appeared that it could be used provided one man bailed all the time. We cut some oars out of branches and rowed across to Latvia.

The day rose bright and glorious as we rowed out into the middle of the lake. We were weary but happy. My companions were singing, while I kept meditating upon the great, sad land I had left behind. I looked at and thought of Russia, the Russia I have learned to love second only to my country, and I wondered sorrowfully on what is to be her fate. But, whatever her fate, I shall not fail to return to her and on her bosom pay her the homage of a friend.—*The Literary Digest*, April 9, 1921.

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NOTES ON INTERNATIONAL AFFAIRS

FROM MARCH 10 TO APRIL 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

AMERICAN POSITION ON MANDATES

SECRETARY HUGHES STATES AMERICAN RIGHTS.—In a note despatched to the British, French, Italian and Japanese governments and made public on April 6, Secretary Hughes made clear the purpose of the new Administration to insist upon the right of the United States to participate in all decisions regarding mandates. The note first states the general right of the United States to take part in the disposal of former German possessions, then cites President Wilson's reservations regarding the island of Yap, and closes with the request that the mandates purporting to deal with the Pacific islands be reconsidered. The first part of the note reads as follows:

"With respect to the mandate to Japan purporting to have been confirmed and defined in its terms by the Supreme Council of the League of Nations, of the German possessions in the Pacific Ocean, lying north of the equator, this government deems it appropriate to state the fundamental basis of its representations and the principles which, in its view, are determinative.

"It will not be questioned that the right to dispose of the overseas possessions of Germany was acquired only through the victory of the allied and associated powers, and it is also believed that there is no disposition on the part of the British Government to deny the participation of the United States in that victory. It would seem to follow necessarily that the right accruing to the allied and associated powers through the common victory is shared by the United States and that there would be no valid or effective disposition of the overseas possessions of Germany, now under consideration, without the assent of the United States.

"This government must therefore point out that, as the United States has never vested either the Supreme Council or the League of Nations with any authority to bind the United States or to act on its behalf, there has been no opportunity for any decision which could be deemed to affect the rights of the United States. It may also be observed that the right accruing to the United States through the victory in which it has participated could not be regarded as in any way ceded or surrendered to Japan or to other nations, except by treaty, and that no such treaty has been made.

"The fact that the United States has not ratified the treaty of Versailles cannot detract from rights which the United States had already acquired, and it is hardly necessary to suggest that a treaty to which the United States is not a party could not affect these rights. But it should be noted that the treaty of Versailles did not purport to secure to Japan or to any other nations any right in the overseas possessions of Germany save as an equal right therein should be secured to the United States.

"On the contrary Article 119 of the treaty of Versailles provides: Germany renounces in favor the principal allied and associated powers all her rights and titles over her overseas possessions.

"It will not be questioned that one of the 'principal allied and associated powers' in whose favor Germany renounces her rights and titles is the United States. Thus, not only could the position of the government of Japan derive no strength from the treaty of Versailles or from any discussions preliminary thereto, but the terms of that treaty confirm the position of the government of the United States.

"Further the draft convention relating to the mandate for the German concessions in the Pacific Ocean, north of the equator, which was subsequently proposed, proceeded in the same view, purporting on behalf of the United States as one of the grantors to confer the mandate upon Japan, thus recognizing the right and interest of the United States and the fact that the proposed action could not be effective without the agreement of the United States as one of the principal allied and associated powers.

"As the United States did not enter this convention or into any treaty relating to the subject, this government is unable to understand upon what grounds it was thereafter attempted to confer the mandate without the agreement of the United States. It is manifest that the League of Nations was without any authority to bind the United States, and the confirmation of the mandate in question and the definition of its terms by the Council of the League of Nations in December, 1920, cannot be regarded as having efficacy with respect to the United States.

"It should be noted that this mandate not only recites Article 119 of the Treaty of Versailles, to the effect that 'Germany renounces in favor of the principal allied and associated powers all her rights over her overseas possessions, including therein the groups of islands in the Pacific Ocean lying north of the equator,' but also recites that 'the principal allied and associated powers agreed that, in accordance with Article XXII, Part I (covenant of the League of Nations), of the said treaty, a mandate should be conferred upon His Majesty the Emperor of Japan to administer the said islands, and have proposed that the mandate should be formulated' as set forth. While this last quoted recital, as has already been pointed out in previous communications by this government, is inaccurate in its terms, inasmuch as the United States, as one of the principal allied and associated powers, had not so agreed and proposed, the recital again recognizes the necessity of the participation of the United States in order to make the proposed disposition effective."

At this point a memorandum is cited, drawn up by President Wilson on March 3, 1921, making clear that he had on several occasions insisted in the Supreme Council that Yap should be internationalized, and that he had at no time consented to its allocation to Japan. Furthermore, it is pointed out that the American note of Nov. 9, 1920, protested against such allocation. The present note concludes:

"It is a cause of regret to this government, that after and despite this protest, there should have been any attempt to pass upon drafts of mandates purporting to deal with the Pacific Islands, including Yap, and that a mandate should have been approved or attempted to be put into effect, which, while purporting to be made in the name of the United States, was without the assent of the United States. This government trusts that this action, which it must assume was taken under a misapprehension, will be reconsidered.

"In particular as no treaty has ever been concluded with the United States relating to the Island of Yap, and as no one has ever been authorized to cede or surrender the right or interest of the United States in the

island, this government must insist that it has not lost its right or interest as it existed prior to any action of the Supreme Council or of the League of Nations, and cannot recognize the allocation of the island or the validity of the mandate to Japan.

"In this view, this government deems it to be unnecessary at this time to consider the terms of the so-called 'C' mandates, or the discussion with respect thereto.

"This government, as has been clearly stated in previous communications, seeks no exclusive interest in the Island of Yap, and has no desire to secure any privileges without having similar privileges accorded to other powers, including, of course, Japan, and relying upon the sense of justice of the government of Japan and of the governments of the other allied and associated powers, this government looks with confidence to a disposition of the matter whereby the just interests of all may be properly conserved."

ALLOCATION OF CABLES.—Leaving aside the settlement of the Yap dispute, the Cables Conference by the close of March had reached tentative agreement regarding the allocation of cables. By this agreement, it is understood, the United States would secure full ownership of the line from Guam to Yap in the Pacific, while Japan would control the lines from Yap to Shanghai and from Yap to the Dutch East Indies. Until the Yap dispute is settled, however, Japan will insist on operating the Yap end of the Yap-Guam cable.

In the Atlantic, the United States would secure the line from New York to Brest, Italy an important link in one of the Azores cables, and Great Britain the former cable from Germany to the United States which was diverted to run from Canada to England.

MANDATE TERMS PUBLISHED

JAPAN ON PACIFIC MANDATES.—Tokio, March 24 (Associated Press).—Japan's intentions as to mandatory for the former German islands in the Pacific, among them the island of Yap, are outlined in a 700-word communique issued by the Foreign Office to-day. Japan will promote the moral and material happiness of the inhabitants and soon will supersede the present maladministration with a civil government, says the communique.

Reiteration is made of the intention, "in consonance with the spirit of the mandate," not to establish military or naval bases. The communication calls attention to the tendency to exaggerate the economic and strategic value of the islands, "whose total area is smaller than Rhode Island," and points out that Yap contains only eight square miles, which is less than one-third of Guam, and that its harbors are barely capable of accommodating three steamers whose combined tonnage is not more than 9000 tons. The island has no natural produce, it adds, and except for its cable facilities is a "worthless piece of barren soil in mid-ocean."

"It might as well be said," the Foreign Office declares, "that the United States obtained control of the Atlantic seas by the purchase of the Virgin Islands as to say that by the mandate to the islands in the South Pacific Japan has staked a sea area of 4,000,000 square miles from Kamchatka, in the north, to the South Pacific islands."

The Foreign Office then characterizes as fabrication reports which have been circulating that Japan is shifting administrative headquarters for

the Marshall Islands from Jaluit to Woese for strategic purposes, is preventing the landing of foreign merchants, and is unlawfully interfering with American missionaries and closing the mission schools.

BRITISH MANDATES IN PACIFIC AND AFRICA.—London, March 22 (Associated Press).—The League of Nations to-day issued the text of the mandates for the administration of Samoa by New Zealand; of Nauru, or Pleasant Island, in the Pacific, a short distance south of the equator, by Great Britain; of German Southwest Africa by the Union of South Africa, and of the former German possessions in the Pacific south of the equator, other than Samoa and Nauru, by Australia, in accordance with the laws of these mandatories.

The terms provide for the promotion of the material and moral well-being of the inhabitants of the territories, prohibition of slave trading and prohibition of forced labor except for essential public works, for which adequate remuneration is to be paid.

Traffic in arms and ammunition is to be controlled. The supplying of intoxicating spirits and beverages to natives is prohibited. Military training of natives is forbidden except for police and local defense.

No military or naval bases are to be established or fortifications erected. The free exercise of all forms of worship shall be allowed, and missionaries and nationals of states members of the League of Nations shall be permitted to travel and reside in the territories and follow their callings.

The mandatories are required to report to the League of Nations annually on the territory under mandate and the measures taken to carry out their obligations.

The consent of the Council of the League is required to any modification of the terms of a mandate. If any dispute shall arise between a mandatory and other member of the League regarding the mandate it shall not be capable of settlement by negotiation but instead the dispute must be submitted to the Permanent Court of International Justice of the League.

FRENCH MANDATES IN AFRICA.—Paris, March 25.—The régime which the French Government to-day announced for the former German colony of the Cameroons, which France holds under a Class B mandate, stipulates that there shall be commercial equality as provided by "Article XXII of the Treaty of June 28, 1919," that is under the covenant of the League of Nations.

The administrative plan for Togoland does not mention commercial equality. By their publication as decrees signed by President Millerand in the *Journal Officiel* to-day these administrative plans become law. The Council of the League is to consider Class B mandates in May or June and may or may not change the régime France established to-day for those colonies.—*N. Y. Times*, March 23.

BRITISH REPLY TO U. S. OIL PROTEST.—London, April 5.—American contentions for equality of treatment for the citizens of all nations in mandated territory are held by the British Government to be "scarcely consistent" with the attitude of the United States toward American oil interests in Mexico. The British view is expressed in a long reply to Secretary Colby's note of last November 20, which was made public here to-day.

The note, signed by Lord Curzon, Secretary of State for Foreign Affairs, was delivered March 1, and was in answer to Secretary Colby's exceptions to the San Remo agreement between Great Britain and France relating to petroleum resources in Mesopotamia. That agreement, Lord Curzon said, was not fully understood, it appeared, adding that it "aimed at no monopoly or exclusive rights."

The Mesopotamian agreement was said by Lord Curzon to be subject to oil concessions in the vilayets of Bagdad and Mosul, granted to British interests before the war, and not to be treated "merely as a matter of abstract principle" without reference to pre-war negotiations. Rights acquired in Palestine by the Standard Oil Company "are no stronger" than these British rights, the note added.

The British note expresses agreement with the American argument that the world's oil resources should be open for development without reference to nationality, but states that an act of the Philippine Legislature in 1920 reserves development of public mineral lands there to citizens of the United States or the Philippines. Such legislation cannot but be regarded "as in contradiction of the general principle enunciated by the United States," it continued, and adds:

"In this connection I observe that Mr. Colby does not attempt to refute the statements contained in my note of August 9 last, concerning the action taken by the United States Government to prevent the exploitation by British interests of such resources in Haiti and Costa Rica."

Reverting to the United States attitude toward American oil interests in Mexico, the British note cited Mr. Colby's letter of Nov. 25, 1920, to Roberto V. Pesquiera, then representative of the new Mexican Government in Washington. In that communication, it said, Mr. Colby "expressed particular satisfaction at the statements made in M. Pesquiera's letter, then under reply, to the effect that President de la Huerta and President-elect Obregon had declared that Article 27 of the Mexican Constitution 'is not and must not be interpreted as retroactive or violative of valid property rights.'"

Lord Curzon made reference to Secretary Colby's "allusions" as to the world's oil supply and the statement that the United States possessed only one-twelfth, approximately, of world oil resources. The question, he said, was of "subsidiary importance," but added that while "the potentialities of the future are necessarily problematical, the undisputed fact remains that at present United States soil produces 70 per cent and American interests in adjoining territory control a further 12 per cent of the oil production of the world."

"It is not easy, therefore," Lord Curzon said, "to justify the United States Government's insistence that American control should now be extended to resources which may be developed in mandated territories, and that, too, at the expense of the subjects of another state who have obtained a valid concession from the former government of those territories."

GERMANY

GERMANY DEFAULTS REPARATIONS PAYMENT.—Under the Versailles Treaty Germany was pledged to pay 20 billion marks prior to May 1, 1921. Of this, the Reparations Commission reckoned that only 8 billion had been paid, and demanded 1 billion marks on account on March 23. On this date Germany presented a note declaring that the full 20 billion had already been paid, that if she did owe the money she could not pay it, and that she was willing to reopen discussion. The commission denied each of these points, and reported the matter to the allied powers.

In a speech on April 5 Premier Briand of France indicated that the Allies would inflict no new penalty prior to May 1. On that date the allied demands would be definitely presented, and such measures as necessary would be taken to enforce payment.

GERMAN APPEAL TO UNITED STATES.—On March 23, coincident with her refusal to make a payment of one billion marks to the Allies, Germany sent to the American government an informal memorandum. The memorandum (published April 5) expressed Germany's willingness "to make reparations to the limit of her ability," but complained (1) that France preferred leaving the devastated regions unrepaired as a means of emotional appeal; (2) that immediate money payments could be made only by means of an international loan, based on German Government securities, upon which the allied powers should temporarily waive their lien.

In reply, Secretary Hughes supported the allied powers in their insistence that Germany must accept responsibility for the war, and pay to her utmost. His note follows:

"The American government is pleased to note in the informal memorandum of Dr. Simons the unequivocal expression on the part of the German Government of its desire to afford reparation up to the limit of German ability to pay. This government stands with the governments of the Allies in holding Germany responsible for the war and therefore morally bound to make reparation, so far as may be possible. The recognition of this obligation, implied in the memorandum of Dr. Simons, seems to the government of the United States the only sound basis on which can be built a firm and just peace under which the various nations of Europe can achieve once more economic independence and stability. This government believes that it recognizes in the memorandum of Dr. Simons a sincere desire on the part of the German Government to reopen negotiations with the Allies on a new basis and hopes that such negotiations, once resumed, may lead to a prompt settlement which will at the same time satisfy the just claims of the Allies and permit Germany hopefully to renew its productive activities."

GERMANY WINS SILESIA PLEBISCITE.—The plebiscite contest between Germany and Poland for Upper Silesia, held on March 20, resulted in a victory for Germany by about 713,000 to 460,000, 14 out of 17 of the different plebiscite areas giving a German majority. Of the three areas that voted for Poland, one is in the middle of the province, one on the southern Polish frontier, and one on the northeastern frontier.

On April 8, the German Government handed to the French Foreign Office a document of seven pages with about 500 pages of addenda asking that all Upper Silesia be given to Germany. Before April 21 the Supreme Council must render its decision, which will probably be to divide the districts, so far as possible, according to the vote. Opposition is directed chiefly against giving to Germany the rich mining district in southeastern Silesia, the annual production of which is estimated at 190 million tons of coal, 34 million tons of iron ore, 20 million tons of raw iron, and 17 per cent of the world's production of zinc.

RED RIOTS SUBDUED.—Communist riots, said to have been inspired from Russia, occurred during the latter part of March in many districts of Germany. In Hamburg on March 23 the city administration buildings and shipyards were seized. On March 30 trouble extended to Moers and Crefeld within the Belgian occupied zone. At Berlin the situation was kept in control, and no response was made to the Communist summons for a general strike.

AUSTRIA AND HUNGARY

FINANCIAL MEASURES FOR AUSTRIA.—Following the March conference on German reparations, allied representatives took under consideration the Austrian appeal for financial relief. On March 17, the allied powers expressed their willingness to release for a period of years their liens against Austria for reparations, etc., provided other interested governments did the same. The securities thus released, including customs revenue and tobacco monopoly, were to be turned over to the Financial Commission of the League of Nations. Gold bonds would then be issued against these securities as collateral for private loans, in accordance with the so-called Ter Meulen scheme proposed by the Dutch banker, Ter Meulen. The Financial Commission met on March 28 to carry the plan into execution, and on April 4 the Danish banker, Emil Gluck, accepted an invitation to take over the reorganization of Austria's finances.

Chancellor Mayr of Austria, in an interview on April 4, expressed the view that allied government encouragement and guarantees would be necessary to enable Austria to secure loans on anything like reasonable terms.

EX-EMPEROR CHARLES ATTEMPTS HUNGARIAN COUP.—On Friday, March 24, the former Emperor Charles secretly passed through Austria from Switzerland, spent Saturday night on the estate of Bishop Mikes at Steinamanger within the Hungarian frontier, and on Sunday appeared in the palace at Budapest. After a long interview with the regent, Admiral Horthy, Charles returned to Steinamanger.

The allied powers on April 1 served notice to Hungary that the return of Charles to the throne would not be tolerated, and demanded his immediate expulsion. The Little Entente—Rumania, Czechoslovakia, and Yugoslavia—also served an ultimatum threatening military action in case Charles should not leave the country by Thursday, April 7. The Hungarian Assembly on April 1 passed a unanimous resolution condemning the ex-Emperor's return in the sharpest terms. Austria on April 4 granted a safe conduct for Charles back through Austria in case his exit were made within 48 hours.

Seeing no hope of a popular uprising in his favor and no signs of the promised army of 15,000 men, Charles returned to Switzerland, on August 6, leaving the following proclamation:

"His Majesty leaves the country because of his conviction that the moment has not yet come for him to take over his right of governing. He cannot permit maintenance of his right to entail disturbances in the present state of peace. He leaves the land as the crowned King of Hungary.

“(Signed) CHARLES.”

UNITED STATES

VIVIANI STUDIES AMERICAN POLICY.—Réné Viviani, Envoy Extraordinary from France, arrived in New York on March 28. He indicated that the purpose of his visit was in no sense to appeal or dictate, but to greet the new administration, gather information regarding American desires and policies, and give such information as might be desired regarding the

policies of France. On March 30, M. Viviani called on the President and spent an hour with Secretary Hughes. The French envoy also had several conferences with Senator Knox and other congressional leaders. Stephane Lauzanne, editor of the *Paris Matin*, who accompanied M. Viviani, cabled to his paper on April 3 that the Senate would pass the Knox Resolution for a separate peace with Germany, and that neither the Treaty of Versailles nor the League of Nations would be ratified.

SHARP NOTE TO PANAMA.—Following Panama's expressed unwillingness to accept the boundary award of Chief Justice White, Secretary Hughes, on March 15, sent another note to Panama, insisting that that country indicate definitely its willingness to comply with the representations made by the United States. The note reviewed the controversy with Costa Rica, pointed out the validity of the awards made by President Loubet of France in 1900, and by Chief Justice White in 1914, and requested that arrangements be made at once for a joint survey to establish the boundary in accordance with these decisions. The Panama Assembly later upheld the President in his opposition to the American request.

NORWEGIAN CLAIMS IN HAGUE COURT.—Washington, April 5 (*Associated Press*).—A suggestion that Norway's claims against the United States for ships requisitioned during the war be adjusted by arbitration before the permanent court at The Hague was made by Secretary Hughes, April 1, in a note to Minister Bryn, of Norway.

The note of Secretary Hughes was in reply to representations made by Mr. Bryn and discussed "certain proposals advanced by the Minister for the settlement of this claim." In it Mr. Hughes expressed himself as favorable to an adjustment of the claim by arbitration before the permanent court of The Hague, in accordance with the convention of arbitration concluded April 14, 1908, between the United States and Norway.

Chairman Benson of the Shipping Board explained that an allowance of \$14,157,000 was made by the board for a number of contracts for ships under construction in this country for Norwegians, which were taken over by this government during the war and completed. Norway, however, it was said, expressed dissatisfaction with the amount, contending that allowance should be made for the speculative value of the contracts.—*N. Y. Times*, June 4.

GREAT BRITAIN

BRITISH LABOR CONFLICT.—Following a deadlock with operators, coal miners throughout the United Kingdom stopped work on April 1, and by their action threatened a general paralysis of industry. Up to April 10 the government had no success in its efforts to bring miners and owners into conference, but it was finally agreed that they should meet on April 11.

At a joint meeting of the executives of the railroad men and transport workers it was decided that, provided a coal agreement was not reached by Tuesday, April 12, "the full strike powers of the Triple Alliance should be put into operation," including 900,000 miners, 1,130,000 transport workers, and 481,000 railroad men.

Far-reaching powers were assumed by Premier Lloyd George and his cabinet, including control of mines, food supply, public utilities of all kinds, and shipping, and on April 8 a general call was issued for volunteers for civil and military duties.

TALBOT APPOINTED IRISH VICEROY.—On April 2, it was announced that Lord Edmund Talbot would succeed Viscount French as the First Viceroy of Ireland, under the New Home Rule Act. His first duty will be to issue writs for the election of members to the two parliaments for Northern and Southern Ireland. These elections are scheduled for May. It is the intention of the Sinn Feiners to contest all seats in this election, but the Sinn Fein candidates in Southern Ireland will not take seats if elected.

Lord Talbot is the leading lay Catholic in England, and the first Catholic to be appointed Viceroy of Ireland.

RUSSIA

COLLAPSE OF KRONSTADT REBELLION.—Bolshevist forces, said to have numbered 60,000, under the direction of Trotzky, succeeded on March 17 in overcoming the rebel garrison of Kronstadt and seizing the fortress. A large number of refugees fled into Finland.

POLISH-SOVIET TREATY SIGNED.—The Russo-Polish Peace Treaty was signed at Riga on March 18. The treaty gives Poland 30 million gold rubles damages, and a fairly defensible frontier, practically as fixed by the preliminary treaty. Ukrainia was represented in the final negotiations.

ANGLO-RUSSIAN TRADE AGREEMENT.—During the third week in March the British Government concluded a trade agreement with Soviet Russia. Under the agreement Russia consents to refrain from propaganda in British territory; the British withdraw all blockade measures, and provision is made for free communications and exchange and for resident commissioners with wide powers. Great Britain secures the same rights for her ships in Russian as in other foreign ports, official agents exercising the usual consular functions, protection of British funds and merchandise in Russia, and recognition in principle on the part of Russia of liability for compensation to individuals for goods or services provided to Russia.

RUSSIA SEEKS AMERICAN TRADE.—On March 20, Maxim Litvinoff, former Russian envoy to England, addressed to Congress and the President of the United States an appeal for resumption of trade relations. The note referred to allied aggressions upon Soviet Russia and to President Wilson's fixed hostility; it called attention to Russia's work of reconstruction, and denied categorically any intention to interfere with American internal affairs; finally it made a formal proposal that a special delegation be sent to America to open trade negotiations.

AMERICA REJECTS TRADE APPEAL.—Secretary Hughes on March 25 rejected the Russian trade proposal in the following terms:

The Government of the United States views with deep sympathy and grave concern the plight of the people of Russia and desires to aid by every appropriate means in promoting proper opportunities through which commerce can be established upon a sound basis. It is manifest to this government that in existing circumstances there is no assurance for the development of trade, as the supplies which Russia might now be able to obtain would be wholly inadequate to meet her needs, and no lasting good can result so long as the present causes of progressive impoverishment continue to operate. It is only in the productivity of Russia that there is any hope for the Russian people, and it is idle to expect resumption of trade until the economic bases of production are securely established. Production is conditioned upon the safety of life, the recognition by firm guarantees of private property, the sanctity of contract and the rights of free labor.

If fundamental changes are contemplated, involving due regard for the protection of persons and property and the establishment of conditions essential to the maintenance of commerce, this government will be glad to have convincing evidence of the consummation of such changes, and until this evidence is supplied this government is unable to perceive that there is any proper basis for considering trade relations.

NEAR EAST

TURKS STOP GREEK OFFENSIVE.—In spite of French warnings, the Greek forces in Asia Minor began a general offensive on March 23 against the Turkish Nationalists. The purpose of the drive was apparently to demonstrate the ability of the Greeks under Constantine to enforce the Treaty of Sévres and dispose of Mustapha Kemal. By March 28 the Greeks had captured the junction where the Smyrna branch joins the main line of the Bagdad railway, and were proceeding thence towards Angora. By April 5, however, the Greek drive had been stopped, with the Turks still in possession of Eski-Shebr at the junction of the Bagdad road and the Angora branch. Withdrawal of French troops in Cilicia had enabled the Turks to concentrate all their forces against the Greeks, who found themselves in serious difficulties.

ALLIED TERMS TO GREEKS AND TURKS.—The work of the London Conference on the Near East ended on March 12, at which date drafts of allied proposals were handed to both Greeks and Turks. The Greeks had received orders from Athens to insist on the Treaty of Sévres, whereas the Allies would have been willing to modify the treaty in favor of the Turks if thereby they could reach peace with both Turkish factions. Upon receiving the proposals the Turks were assured admission to the League of Nations in case the terms were observed, and were promised a possible revision of the Smyrna arrangement at the end of 5 years. They were told that the boundaries of independent Armenia would be determined by a League Commission.

RUSSO-TURKISH TREATY.—The peace agreement between the Turkish Nationalists and Soviet Russia was signed on March 16. The Turks surrender control of the town and district of Batum to the republic of Georgia. The treaty provides for repatriation of prisoners of war and resumption of commercial relations.

PERSIA WOULD CANCEL BRITISH TREATY.—The new ministry established in Persia in March issued early in April a statement of its policies, which included cancellation of all treaties, agreements, and capitulations limiting Persia's sovereignty, and measures for the establishment of Persia on a basis of complete independence. The carrying out of this policy would mean the withdrawal of British forces and the downfall of the so-called Curzon policy in Persia.

REVIEW OF BOOKS

"The Shipbuilders' Blue Book for Shipfitters and Other Shipworkers." By Walter Kay Crawford. Price \$1.00. (Published by the Ocean Publishing Company, 25 West 42d St., New York.)

This book is stated by the author to be a practical handbook embodying information he has gained in repair and new work. It deals principally with the question of riveting, some 25 of the book's 80 pages being devoted to that subject. While nothing like as comprehensive and complete as are the Navy Standard Specifications for Riveting, this book contains valuable data on the subject which will be useful for those not having the official pamphlet.

In addition to covering "everything on rivets and riveting," there are 19 pages of tables of measures, unit weights of materials, and tables of diameters and circumferences of circles varying by eighths from 1" to 135/8", and 21 pages of "Glossary of Terms Used in Shipbuilding." This information is not new and can be found in a number of engineering or shipbuilding handbooks.

W. G. D.

"Orders, Decorations and Insignia: Military and Civil." By Colonel Robert E. Wyllie. (Published by G. P. Putnam's Sons.)

As stated in the foreword by General March, Colonel Wyllie's book, "Orders, Decorations and Insignia," will be of interest not only to wearers of decorations, but, as a book of reference, to people of other countries as well as to Americans." Colonel Wyllie's book has filled a want among reference books. This need was made even greater during the World War on account of the large number of foreign decorations given to Americans, and the new American medals awarded, as well as the many changes in insignia. It is probably the most thorough and complete book on orders and decorations that can be found in American literature, but the subject of insignia has been only touched on in a most casual manner.

The author has traced the history of the award of orders, medals and decorations from the first century of the Christian era down to the present time. One interesting historical fact he records is that General George Washington awarded the first American decoration. This award was presented August 7, 1782. It consisted of the figure of a heart in purple cloth or silk to be worn on the facings over the left breast. But the more important and significant fact is that this decoration is the first in all history to be awarded to enlisted men. The history of military orders begins with a claim that they had their origin in King Arthur's Knights of the Round Table in the sixth century. However, their historical record commences

at the time of the Crusades. And so on through these chapters, the history of orders and decorations is dealt with by Colonel Wyllie in a most exhaustive way, showing the careful study and research of a student.

The descriptions and illustrations of the orders and decorations are excellent. There are three hundred and sixty-seven illustrations, with over two hundred in colors. However, it would be less confusing for the reader if the plates were numbered. Also, in several instances, the wrong plate is referred to in the text; but this is probably due to typographical errors.

The author has realized that all awards to Americans in the late war are of particular interest to his readers just now, so he has treated American decorations, service medals and badges in detail. Also, a complete history is given of the medals of the Allied countries (even including the little principality of Monaco) that were awarded Americans, with illustrations of the more important ones.

The title of the books includes insignia. But only forty of the two hundred and fifty pages refer to insignia and thirty-one of these relate to the shoulder insignia or special badges worn by our overseas forces to denote divisions and corps. Perhaps the author's idea was that the subject of insignia (except shoulder insignia) has been treated at length in many instances and would simply be a compilation by him. However, since insignia is named as a title the insignia of rank and distinctive colors of arms of the service are very incomplete.

J. W. B.

"A History of the Transport Service." By Vice-Admiral Albert Gleaves, U. S. Navy. Price \$6.00. (New York: Geo. H. Doran Co., Publishers.)

This is an exceedingly interesting history of the transport force, depicting in realistic style the many difficulties encountered by the personnel, how they overcame them and accomplished their mission of landing an army safely in Europe, "achieving what the enemy thought impossible."

After describing in detail the first expedition and the lessons learned from it, the routine manner of feeding, berthing and handling the troops, and the repairing and refitting of the damaged German vessels, the author, the officer in command of the convoy operations in the Atlantic, tells of the various precautions taken to avert danger and to guard the troop carriers: Burney gear (paravanes), special lookouts, darkening ship, zig-zagging, smoke screens, the value of camouflage, etc. Following this is the narration of some of the unusual happenings other than actual contacts with submarines, notably: flu epidemic aboard ship, fire on the *Henderson*, depth bomb explosion on the *Orizaba*, *Great Northern* in collision with the *Brinkburn*, and the *San Diego* sunk by a mine.

As was to be expected, this duty was particularly hazardous and a large percentage of the navy casualties was sustained by the transport force. Thrilling accounts are vividly portrayed of submarine attacks on the *Finland* and the *Mt. Vernon*, and of the *Henderson* ramming a submarine; also of the attacks on and sinkings of the *Antilles*, *President Lincoln*, *Covington* and *Ticonderoga*.

Various personal touches including letters, slogans, statements of men who lived through terrible experiences, and official orders add zest to the thrilling accounts which include the adventures of Lieutenant Whitemarsh at sea for several days in an open boat before being picked up; and of Lieutenant Isaacs who was taken prisoner and escaped from a German prison; and of the survivors of the *Mt. Vernon's* engineer's force.

The book is unusually well illustrated and is sure to receive a popular welcome by the services and the general reading public as a valuable addition historically and as a collection of absorbingly interesting narratives of actual incidents.

Seven appendices list the names of the ships in the transport service, giving dates and number of trips made, the number of troops carried by months, etc., after which is added a copy of the secret memorandum of Admiral Von Holtzendorff, chief of the German Admiralty.

F. M. R.

"The Art of Fighting." By Rear Admiral Bradley Fiske. Price \$3.00. (Published by The Century Company.)

The object of this book, as stated by the author in his preface, is to impart in simple language, knowledge of principles of the art of fighting, especially of strategy.

The text is divided into three parts. Part I has four chapters on fighting and war in general which trace developments from contests between individuals and tribes to wars between nations. Part II comprises fifteen chapters of historical illustrations which briefly cover the principal campaigns of foremost military and naval leaders from the ancients, Thutmose III and Rameses II, down to the recent World War. Part III concludes the book with three chapters on "Strategy in Peace," "Strategy in War" and "Strategy as Related to Statesmanship."

As would be expected from the pen of an officer of such exceptional attainments, this book admirably accomplishes a useful purpose. There is no other single volume which presents so clearly and so entertainingly such a wealth of information on this important subject.

It should be stated that in places the book is somewhat discursive. Many readers will consider it an added attraction that the pages are enlivened by sidelights of personal experience and opinion. On the other hand, some may question the wisdom of injecting controversial matter as tending to divert attention from the main theme. For example, some of the opinions and speculations of the author on the subject of aircraft will be challenged. On this particular topic, however, the author himself admits a certain amount of bias. Notwithstanding these possible criticisms, all will agree that "The Art of Fighting" is an extremely valuable contribution to the list of books on war.

The author's views on war in general, the relation of strategy to statesmanship, the fallacy of pacifism and the urgency of developing good strategy and skill in the art of war during periods of peace, are presented with convincing logic. Admiral Fiske's observations on the World War

will be read with particular interest. Extensive quotation cannot be made in the space allotted this review, but a general idea of the admiral's conclusions may be gathered from the following excerpts:

"It may be argued that the world has at last reached such a height of civilization that war is no longer needed. But, as war has always existed, there are no data on which to base such an argument. If wars were to cease, the human race would find itself embarked on an unknown sea, for which the records of the past would furnish no chart or compass. Exactly what would happen to the race, we do not know. We have records, however, that extend over a period of more than five thousand years; and these records show that the combination of wealth and long-continued peace has been not only harmful but distinctly ruinous to every nation that has been subjected to its influence.

"In judging whether or not civilization has now reached a stage in which the past may be ignored, let us remind ourselves that the number of individual human beings that are really civilized by education and character is, even now, only a small fraction of the people of the earth. The majority are held in subjection by the minority. But the barbarians were long held in subjection by Rome, and much more firmly than barbarians are held now. The barbarians ultimately triumphed over Rome; and as the antagonism between barbarism and civilization is as great as it ever was, and is increased by the ostentatious luxuriousness of the rich, the barbarians (or anarchists or bolshevists) may triumph again. The reason that the barbarians were able to triumph over Rome was that Rome became luxurious and neglected the military arts. If we neglect the military arts, the barbarians (or anarchists or bolshevists) may triumph over us—and probably will.

"Inasmuch as a most powerful factor in bringing the nations of the world into their present condition of civilization has been war, and inasmuch as the consensus of civilized opinion seems to be that this condition is better than our original condition of savagery, one is led to question the correctness of the assumption so generally held that war is an evil. The question involved is too profound to be reasonably entered into in a book of this kind; but in the interest of truth the fact must not be overlooked that, while peace is a much pleasanter phase of life than war is, yet the record of history for more than five thousand years shows, with no exception whatever, that long-continued periods of peace and prosperity have always brought the physical, mental, and moral deterioration of the individual. It may also be pointed out that, while the Savior's teachings inculcated kindness and good will as among individuals, they never condemned war among nations or disparaged warriors. They seem to show a recognition of the fact, that, in a good cause, one ought to fight if necessary. In other words, they seem to preach that neither right nor wrong exists in fighting itself; the right or the wrong is concerned in the cause fought for. The Savior Himself committed an act of violence when he overturned the tables of the money-changers in the temple.

"We thus see that, up to the present time, the influence of war on history has been not only favorable to civilization, but essential to it. Of

itself, war has not directly contributed to civilization, though it has done so indirectly in some ways. Its main accomplishments have been first to assist a healthy civilization to triumph over barbarism, and, second, to cause the destruction by healthy peoples of every nation that had become overcivilized and effete.

"The dominant agency of war is strategy; tactics and logistics are its subordinates. Strategy points the way to battles, arranges the conditions under which it shall begin, under which it shall be fought and under which subsequent operations shall be carried on. Logistics arranges that the men and ships shall be supplied, and afterwards that they shall be properly fed and armed; and tactics moves them to the battlefield and maneuvers them on the battlefield afterward.

"It may not be inappropriate to point out here that, while many men without military training have been good statesmen, and while many strategists have also been good statesmen, no statesman without military training has ever been a good strategist; though many have thought that they were and have consequently done great harm. It might further be pointed out that the greatest statesmen have been the greatest strategists, and the greatest strategists have been the greatest statesmen. It might be a little bold to suggest, though I myself believe it to be true, that the men who have done the most to insure good government in the world have been men who were both strategists and statesmen, like those whose names head certain chapters in this book (Alexander, Cæsar, Charlemagne, Frederick, Washington, Napoleon, etc.).

"Perhaps it would not be logical to deduce from this that the most important factor in the establishment of stable government has been strategy. But it would be logical to deduce that strategy has been an agency as important as to be immeasurable, and that there is no good ground for declaring that any other agency has been more important. The government of every civilized country was established originally by military force directed by strategy, and was maintained afterward by statesmanship and diplomacy supported by strategy. Which of the three has been the most important it would be useless to discuss; but it cannot be gainsaid with reason that of the three strategy was the first to act, and that others followed.

"Like Cæsar and Frederick, Washington devoted his declining years to the tasks of statesmanship. Like Cæsar and Frederick, he was as fine in statesmanship as he was in strategy. It has been the fashion in America, in speaking of Washington, to concentrate the attention of the people on President Washington and to ignore General Washington. That this has been intentional there can be no doubt; and that it has been a part of the general pacifist movement there can also be no doubt. It and the whole pacifist movement seem to be because of a curious trait in nature which leads successful people and successful nations to ignore the causes of their success; which leads rich families, for instance, to keep persistently in the background the means by which the family money was acquired.

"The independence of the United States was gained by military force, guided by the strategy of George Washington. That the subsequent statesmanship of Washington was fine there can be no doubt. But there can also be no doubt that the task of Washington as President was immeasurably easier than his task as general. As President, he lived at ease in the absolute security and the comparative luxury of the presidential mansion, with assured rest at night, regular and sufficient meals, assisted by the organization of an established government and the resources of a prosperous nation. As general, he had to oppose treachery, negligence, and disaffection in Congress, and among great numbers of the people; and amid the continual dangers of war to direct and force to action a ragged, half fed and half trained army, by day and by night, in heat and in cold, in mud and rain and storm and snow, for five destiny-deciding years. In comparison with this, Washington's career as President was like a vacation.

"A grasp of the elements of strategy by the people of a country is just as important to the safety of the country as a whole, as is knowledge of the elements of hygiene to the health of its individuals.

"In Great Britain, France and the United States, for many years previous to the World War, the strategist, while not exactly discredited, was, to use an expressive colloquialism, told to "go way back and sit down and keep quiet." In those countries the strategists—in fact, all navy and army officers—knew the dangerous condition of affairs, and did all they could to rouse their governments to a realization of the danger; but their own governments, instead of listening to them, ignored them in effect, and, when they tried to inform the people directly, ordered them to keep quiet.

"The principal single reason why the rest of the world remained so inert, in plain sight of Germany's preparations, was the spread of the pacifist movement. This movement was only a repetition of many in the past that had taken place in wealthy countries; but, by reason of the increased facilities for printing and mailing, it spread much more rapidly than any like movement had ever spread before. It constituted almost an invitation to Germany to take what she wanted; because it dangled opportunity before her eyes and said to her in effect: "Though we are rich and you are poor, we will not even prepare to resist an aggression on your part, except in the wholly improbable case that you should forcibly attack us. If you actually do that, then we will defend ourselves bravely.

"Of all the departments of the British Government, the only department ready was the navy.

"Yet the navy itself was not all it should have been; not from any fault of the navy, but from the same fault as that mainly responsible for the unprepared condition of Great Britain in other departments.

"The unreadiness of the British Navy, as compared with the German, seems to have no other explanation than the fact that, somewhat less than a hundred years before the war, the politicians had become so strong in Great Britain, and had been able to impress the people so thoroughly with the idea that 'the military should be subordinate to the civil authority' that they adopted the practice of putting untrained civilians at the head

of the army and navy. They made the people believe (and possibly made themselves believe) that it was not necessary to have men at the head of the army and the navy who were thoroughly acquainted with the army and the navy; giving out the idea that untrained ministers could direct the army and navy successfully, provided they were men of superior intelligence; and that whatever professional knowledge they might lack they could easily get from professional advisers.

"They neglected to point out that the 'professional advisers' could be ignored, that a minister untrained in technical matters would not be competent to make the best selection of professional advisers, and that the scheme actually promoted irresponsibility. For the minister could always shift the blame for any miscarriage to his professional advisers, and these professional advisers would be perfectly safe, because they were responsible only to the minister himself! They also failed to point out that ministers, untrained in the profession of arms, might appoint assistants whose qualifications were the tact and suavity of the courtier, rather than the force and austerity of the warrior.

"No evidence that would be accepted in a court of law has ever been given which would establish the reasonableness of the proposition that untrained men can manage great professional organizations with real success. Certain it is that managing an army or a navy is a business, in the sense as that in which managing a factory can be said to be a business, or keeping a shop or conducting a hotel, or administering a railroad; and virtually all of these businesses are conducted by men who know them intimately. Certain it is, also, that in this war the head of the admiralty made two bloody mistakes that a man knowing the naval business intimately would not have made.

"Certain it is, also, that the mere fact of army and navy officers knowing that they would never be allowed to decide important strategic questions took away from them not only that interest in the higher part of their profession which they should have had, but also the strategic training they would otherwise have gained. Certain it is, also, that strategic training and the resulting strategic ability were lost to Great Britain; because nobody but army and navy officers could possibly attain it, and no other people did. Certain it is, therefore, that the government of Great Britain for nearly one hundred years lacked the kind of council it should have had. Almost certain it is that, if the government had not lacked that counsel, Great Britain would not have lapsed into unpreparedness, and would not have gone through the agony she has gone through.

"It is noteworthy that this was the first great war in which the British Navy was not headed by a naval officer; that in each war in which it was headed by a naval officer it showed more dash, resourcefulness, and strategic ability than did any of its adversaries; that in this war it showed less dash and resourcefulness and strategic ability than the German Navy; and that the German Navy was headed by a naval officer.

"It is a principal fundamental to the efficient handling of every organization that the man at its head should have been specially trained for his task."

C. C. G.

"The War of the Future, in the Light of the Lesson of the World War." By General von Bernhardt. Translated by F. A. Holt, O. B. E. Price \$3.50. (New York: D. Appleton & Co., 1921.)

This new book is by the author of the well-known work "Germany and the Next War," which has been widely read and examined as a manifestation of all that was objectionable in the German military viewpoint—before 1914 and afterwards.

But the author had also written an earlier book, "War of To-day" (1911), less widely known and so far free of objectionable viewpoints as to constitute a valuable addition to military literature, by reason of its masterly analysis of war operations.

It is chiefly in the vein of analysis that this latest book is written, as indicated by the title. It is the author's purpose to analyze the methods and means developed during the World War and to apply that analysis to the character of operations probable in wars of the future.

The soundness of General Bernhardt's views of the command function are clearly indicated in the following extracts from his Introduction wherein he re-affirms the basic truth "that the great fundamental laws of war remain the same in all times and in all circumstances, because they are based on human nature and the very essence of the use of force." . . . "their outward manifestations, however, frequently vary in accordance with the political structure and culture of the warring nation, and indeed with the means and methods employed in war. These external manifestations have a compelling character and involve a certain adherence to rule, though only an adherence which changes periodically with the changing circumstances of life and military effort." "Thus the art of war moves between permanent laws and those which change periodically and are ever endeavoring fresh development" . . . "Neither the unchanging nor the periodic laws may be infringed with impunity, and it is the task of him who leads an army to give effect to the general and eternal elements of circumstances which have temporary peculiarities and features." "This is just where the difficulty lies, for there is always the danger that the commander will regard something which under certain given circumstances was in accordance with the rules, and therefore justifiable, as an eternal verity and therefore applicable even though the conditioning circumstances have already changed, so that he is acting under the impulse of preconceived opinions which, in view of the changed situation, must bring him to ruin and defeat." There does not seem to be much here to warrant the criticism of "blind adherence to rigid rules" so often heard in regard to German military thought.

The treatment is best indicated by the chapter headings which follow:

I. The Determining Factors in Modern War.

- i. Masses.
- ii. Military Technics.

II. Tactics.

- i. Infantry.
- ii. Artillery.
- iii. Cavalry and Aircraft.
- iv. Fortifications, Engineers and Railway Troops.

- III. Attack, Defense, and the Initiative.
- IV. The Principles of the Offensive.
- V. The Sources of Power.
- VI. The Influence of Politics and Economics.
- VII. The General Distribution of the Troops.
- VIII. The Battle.
 - i. The Struggle for Local Advantage in Trench Warfare.
 - ii. The Barrage.
 - iii. The Decision in Trench Warfare.
 - iv. Attack and Defense in Open Warfare.

The first chapter deals with the modern method of making war which is indicated in the well-known phrase "the nation in arms," and, also, the development of trench warfare, artillery, gas, mines, aircraft (and submarines) as being the outstanding (and generally unforeseen) features of present-day military technique.

Chapters 2, 7, 8 are chiefly of interest to the military, as distinguished from the naval reader, but Chapters 3, 4, 5 and 6 can be read with much profit by all who are concerned for the welfare and safety of their countries. In general, the author emphasizes the surest means of defense as that form of offensive "re-action," known as the counter-attack. He is also insistent upon the tremendous factor of morale in the present-day conduct of war, thus confirming Napoleon's dictum that "in war, the moral is to the material as three to one."

E. J. K.

Jane's "Fighting Ships, 1920." Editors: Maurice Prendergast and Oscar Parkes, M. B., Ch. B., O. B. E. (Published by Sampson Low, Marston and Co., Limited, London and Edinburgh.)

The "illustrated encyclopedia of the navies of the world" is presented in its twenty-third edition, which comprises a complete post-war revision, which has delayed the appearance of the book some months.

This issue is even more "indispensable" than former issues, in the completeness of its information and in the improvement which has been effected in the illustrations. A large amount of new textual data, and a considerable number of new illustrations and silhouettes have been added. The photographs, which are now dated with year taken, include large-scale aircraft views and detailed views of important features of capital ships.

Torpedo craft are dealt with in a more thorough manner than formerly and diagrams of all the modern types of destroyers have been added whenever practicable.

The former Austrian Navy has ceased to exist. The German Navy is shown reduced to a few pre-dreadnoughts, while the unfinished ships are stated to be in process of conversion to merchantmen and other commercial uses.

A striking characteristic is the post-war conditions marked by the inclusion of the "new" navies of Esthonia, Poland, Finland and of the

Serbs, Croats and Slovenes. The distribution and allocation of ex-German and ex-Austrian warships is shown, including those to be broken up as in the cases of Great Britain and the United States and those to be incorporated in the navies of France and Italy.

Some emphasis is placed on the Pacific fleet of the United States, and especially on the projects for the increase in number and capacity of the Pacific Coast bases. The latest ships to be begun are well shown.

The Japanese naval schemes involved in what are called the "eight and four," "eight and six" and "eight and eight" programs are dealt with in full. The latest information regarding the latest Japanese capital ships appears to be quite complete, including that for super-dreadnoughts and battle cruisers just begun or about to be begun. Photographs of Japanese submarines included in the book are said to be the first such collections ever published.

The publishers state that their data and, in many cases their photographs, have been obtained direct from the naval authorities of the countries concerned, thus insuring a degree of accuracy which serves to make "Jane" indeed the "Who's Who" of the world's naval ships.

E. J. K.

"The Blue Book of Facts of Marine Engineering, Steam, Gas, and Turbine License." Price \$3.00. (New York: Ocean Publishing Co., 25 W. 42d Street.)

A small hand book on the above subjects, designed primarily for the Mercantile Service, as an aid to preparation for examination for license.

It is written in "Question and Answer" form, similar to the Blue-jacket's Manual, and the questions are marked by letter, indicating whether the question is for chief, first, second, or third engineer. Of the total scope covered by the book, thirty pages are devoted to the boiler plant, two to fuel, thirty-five to the engine-room, ten to gas engines, sixteen to turbines, and two to the electric installaions. In addition there are numerous problems worked out in connection with pumps, boilers, engines, piping, strength of materials, fuel consumption, capacities of tanks and bunkers, safety valve setting, and indicator cards. Sample cards are given, showing the various faults. At the end there are several pages of useful information, formulæ, etc.

This book is undoubtedly well adapted to the purpose for which it is intended, and the form in which information is presented makes it particularly suitable for a man preparing himself for examination.

It is, however, somewhat elementary in character, and would be of only limited value to the Naval Service, being founded on engineering practice differing in many particulars from that found on most naval vessels.

R. C. P.

"Naval Lessons of the Great War." By Lieutenant Tracy Barrett Kittingredge, U. S. N. R. F., with a Foreword by Rear Admiral Bradley A. Fiske, U. S. Navy. Price \$2.50. (Doubleday, Page & Company.)

On January 7, 1920, Rear Admiral Sims wrote an official letter to the Secretary of the Navy, the subject being "Certain Naval Lessons of the Great War."

The letter is not only perfectly proper in tone and topic, but its writing was rightly regarded by Admiral Sims as incumbent on him, under the regulations, since circumstances had given him a rare opportunity of knowing and judging the mistakes the Navy Department had evidently made and of which the repetition should be avoided in future. It is free from personalities and captious criticism, but it is unquestionably open to the interpretation of strongly disapproving some departmental measures and methods. It is not hostile to Mr. Daniels' administration, an attitude which nothing in the body of the letter justified the recipient or which justifies the reader in supposing. The writer was careful to keep secret his retained copy, but the original became public, doubtless through some enemy of Mr. Daniels in Washington into whose hands it had fallen. Except for this mischance nothing would ever have been heard of it and, like so many of its kind, it would have been permanently entombed in the departmental pigeon hole reserved for the purposes of oblivion. But instead of the quiet mortuary fate which the friends of the then naval régime would have wished for it, the letter became known throughout the whole land and there ensued in naval circles and the press a noisy battle of words whose reverberations are likely to be heard for many a long day. Mr. Daniels and his adherents, of whom the navy has a few, especially in the highest places, would, in all probability, have been glad to keep the whole correspondence confidential, but this became impossible, for the people quite generally demanded that the truth be made known. The letter in question followed closely upon Admiral Sims' protest against Mr. Daniels' arbitrary awards of honors designed to recognize the merits of those who had served the nation with particular distinction. In this first communication, the admiral had declined for himself the Distinguished Service Medal on the ground that injustice had been done to some of his most worthy subordinates through rejection of his own recommendations. These two official documents combined with popular clamor to make an investigation by a Congressional Committee inevitable. The report of the inquiry being far too voluminous to be widely scanned, one of Admiral Sims' associates has taken upon himself the task of laying before the country an analysis and summary of the proceedings of the Senate Subcommittee appointed to go into the whole matter and he has, in consequence, brought out an absorbingly interesting book.

The author takes no pains to conceal his loyalty to Admiral Sims or his virile indignation aroused by the attempts to disparage the admiral's record, achievements and character and to attribute to him unworthy motives. Whether or not we are of the same opinion as he, this bias must be borne in mind while reading the volume of which the title is, saving one word, identical with that of the admiral's official letter above mentioned.

Effectively, he adopts as his own Commander Turnbull's indictment printed in the *North American Review*: "Officers and men grown grey in the service look with breaking hearts upon its [the navy's] disintegration. They have watched their valiant efforts to save the situation

brought to nothing. They have seen preferment offered to—and alas! accepted by—a scattered few of their brothers and shipmates, who could not keep loyalty to service and country above something that passes as loyalty to an individual. . . .

“Mr. Daniels found the navy in good material condition, manned by a strong, self-respecting personnel, animated from end to end by a fine spirit and a high purpose.

“Mr. Daniels, after seven years of office, will leave the navy a battered hulk, which it will take years of careful repairing to make seaworthy.”

He further charges that Mr. Daniels “regarded the navy primarily as a source of political capital for himself and his party”; that Mr. Daniels “ruled as a despot, ruthlessly crushing opposition, by czaristic and underhanded methods”; “that from 1913 to 1917 he enforced a policy of pacifism upon the navy; that in consequence, he prevented any real preparedness for war”; “that he repeatedly made false statements”; “that he gave testimony under oath before the Senate Committee which was completely at variance with the testimony of other witnesses, and with the facts established by the evidence of official records.”

This is a serious arraignment, the last clause of which recalls to mind the fact that Mr. Daniels took no action on Rear Admiral Decker's letter to the Senate Naval Committee accusing him of falsehood, nor has he yet purged himself of this stain.

Again the author avers that “We entered each war, as a result of the lack of a naval staff, without any real preparation; with no war plans, with insufficient personnel and without reserves; with the vessels of the navy not in a condition to fight; with inadequate docking and repair facilities; with a navy built, apparently, without regard to war needs and lacking many essential types of vessels. All these conditions were due primarily to the fact that the decision of the highly technical naval problems, and the control of the navy's operations in peace time, has rested exclusively with a civilian, without previous knowledge or experience, who was also very often a politician more concerned about patronage, about distributing navy funds to favored sections, about promoting his own or his party's fortunes, than about the possibility of war, or the preparation of the navy for war”; “The service has realized that honors and preferment went, not to the most capable or most deserving, but to the most pliant, and the most subservient, among the officers of the navy. Nothing more destructive of morale can be imagined”; “He [Mr. Daniels] has kept the public, during that time, in ignorance of his tyranny because the navy may not address the nation save through its secretary. He has not only all power over the navy, but his is its only official voice. That voice for seven years has misrepresented conditions in the navy, has deceived the country and Congress and, by its influence on the press and public opinion, has concealed from public notice the nightmare which his régime has inflicted upon the navy.”

The author goes into the matter of “The Daniels Medal Awards” holding that “In accordance with his usual habits, the secretary, on finding himself confronted with the public disclosure of his own action,

endeavored to becloud the issues by attacking his critics. With ruthless disregard of truth, and shameless misuse of confidential and personal reports and letters, he sought to discredit Admiral Sims. His interjection of such attacks and insinuations was not intended in any way to meet the criticisms of his official actions; but was designed purely and simply to damage the officers of the navy who opposed him and to stir up feuds within the navy itself, under cover of which he might hope to escape"; "Until two years after the Armistice, the only officer or man of the United States Navy who had received any recognition from the Navy Department for heroism or distinguished service during the war was Admiral W. S. Benson, Mr. Daniels' Chief of Naval Operations." "He [Mr. Daniels] has again changed the board's report and awarded Distinguished Service Medals to the commanders of ships sunk by German submarines while awarding only a Navy Cross to officers who fought successful actions. He has reduced awards recommended, in a number of cases, to officers not in his good graces."

It is through the evidence presented to the Senate Naval Sub-committee that the author seeks to prove his contentions. He alleges that Mr. Daniels by "his knowledge of the press, and through the misuse of his official power, was able to influence many of the press reports of the hearings"; "The political power of an unscrupulous secretary in Washington is very great. The newspaper men live by news, and often can get it only by playing up to those who control news sources" and he endeavors to show that, instead of meeting and refuting the grave charges made against him, he "aimed at prejudicing this case by wholly irrelevant subjects, prior to its investigation by this committee." Indeed Admiral Sims averred that the secretary had been carrying on a "campaign of deliberate propaganda" to divert attention from the issue.

One of the points brought out by the testimony given to the committee is that the Navy Department was more solicitous of defending our own coasts than of loyally throwing all its weight into joining our allies in offensive measures against the enemy. Moreover, in the early days of the war, "Admiral Benson stated that the present policy of the United States was to maintain the fleet intact and to assist in the patrol of the Atlantic and Gulf coasts." Did he happen to know, one wonders, that a war was actually being waged against the Germans?

The department sought to control the activities of our craft abroad instead of trusting its representative in London who, in close touch with the Allied Council of Defence, was better able to know the needs of the situation than an office three thousand miles distant from the seat of war and not in possession of full information hourly reported. The author even goes so far as to hold that "The lack of any pronounced will to victory on the part of the heads of the Navy Department, their avowed prejudices against certain of the Allies, resulted in their failing to make effective use even of the forces that were available and ready in April, 1917."

He quotes from Admiral Sims' evidence: "It can be said that the failure of the Navy Department to enter the war immediately and whole-

heartedly cost the Allied cause a whole two and one-half million tons of shipping sunk unnecessarily. While this is of course an estimate only, it is based upon actual results obtained when our help became effective, and there is no reason to doubt that it is a conservative estimate"; and that it "delayed the adoption of the convoy system, in the early and critical months of the war, in exactly the same way and apparently with as little justification as in the case of the delay in sending anti-submarine craft." its opinion being thus expressed, "With regard to convoy I consider that American vessels having armed guards are safer when sailing independently." Individual action rather than team work seemed to be its object.

The history of Admiral Sims' first six months in London is a disheartening record of the department's indifference or hostility to his recommendations. Neither for eight months did it give him an adequate staff.

It is in his cross-examination that he was reluctantly forced to give the name of Admiral Benson as saying that "We would as soon fight the British as the Germans," an astounding utterance for the military head of the navy in time of war.

Other officers sustained Admiral Sims' position by their testimony, not only as to the lack of preparedness in material and personnel, but even of war plans and in grievous delay after war was declared in placing contracts for munitions, for repairing ships, for repairing the interned German steamers and for building destroyers, the chief weapon against the submarine. The chief of the Bureau of Navigation, Rear Admiral Palmer, actually took matters into his own hands and, against Mr. Daniels' orders proceeded with the enrolment and training of men. He was charitable enough to attribute the secretary's disheartening opposition to "procrastination," although Admiral Fiske thought it a deliberate policy. The latter's testimony throws much light on Mr. Daniels' attitude towards the organization over which he ruled for eight years and upon that official's character. In his foreword to this volume Admiral Fiske definitely charges Mr. Daniels with making statements "that were absolutely false." In his sworn testimony he quotes instances.

Certain officers will be chagrined to find themselves designated by name as more friendly to Mr. Daniels than to the navy. They have enjoyed the material benefits of his patronage, now must they pay for it in loss of the esteem and confidence of their colleagues. Their example will be a warning to their successors for all time.

What steps will their late patron take to meet these grave accusations? And what will they do to remove the stain from their record? Both he and they cannot remain silent, unless guilty.

Chapter XIV, "Mr. Daniels' Admirals and Their Smoke Screen," in this connection will be found both interesting and illuminating. Rear Admiral Badger makes a bad matter worse in stating as to our lack of certain forms of preparedness (p. 298) that such a step "was denied us by our neutral attitude and effort to avoid giving ground for the belief that we were preparing to take part in the war. I would like," he says, "to accentuate this, for it explains many things."

In reference to the department's attitude as defined by the Chief of Operations, the author remarks (p. 333), that "No more accurate statement of the 'safety first' defensive policies of the department in the early months of 1917 could be imagined than this testimony of Benson's," and he does not hesitate to call one chapter "Victory in Spite of Daniels." If he is correct in his inferences, it would seem not too late to call Mr. Daniels to stern account. The author's analysis of "The Case for the Defense," Chapter XX, is a heavy indictment which demands an explanation by Mr. Daniels and his adherents. Possibly they may be able to show him in error. To make the attempt is surely incumbent upon them for the sake of their reputations.

If our delay in entering whole-heartedly into the war is due to Mr. Daniels personally, then must he accept the responsibility for a similar postponement of victory—a postponement which caused, according to Admiral Sims' estimate, the sacrifice of 500,000 lives, the loss of 2,500,000 tons of shipping and several billions of dollars.

Chapter XXI deserves careful attention as illustrating Mr. Daniels' conduct under cross-examination. There can be little doubt that he avoided answering pertinent questions directly and sought to confuse the record by introducing much irrelevant matter. It is to be regretted that he persistently accused Admiral Sims of belittling the splendid "work of the navy"—something the admiral never did and never thought of doing. On the contrary his eulogies under this head are as frequent and vigorous as Mr. Daniels' unfounded charges.

In summing up the evidence (Chapter XXII), Admiral Sims finds that his criticisms of the department both as to organization and methods are abundantly confirmed by Mr. Daniels' own witnesses and that it did not begin to act vigorously until the President, urged by Ambassador Page, the British Admiralty and the French Ministry of Marine, took personal charge.

The author devotes Chapter XXIII to the causes of our unpreparedness for war and the delays in getting the navy into the war. With his "Conclusions" at the end of the volume every naval officer must in the main agree. The reviewer strongly dissents, however, from any endorsement of the system of promotion by selection, believing it to have been unsatisfactory in its results and a fertile source of sycophancy and discontent. Far better is it, in his judgment, to make vacancies by the elimination of the less fit. Especially pertinent is the author's suggestion that "the navy must clean house, eradicate sycophancy and brand the time servers in its own ranks who betray the navy for their personal advancement."

The book is both a vigorous defence of Admiral Sims and as vigorous an attack on Mr. Daniels and his retainers. It is distressing that so heated a controversy should ever have arisen, but the issue, being once joined, cannot be lightly dismissed. *Audi alteram partem* is the suggestion of prudence and of fair play. Whatever our impulses may be, it is simple justice to hold our final judgment in suspense for the present. After a reasonable delay for the preparation of a brief from the other litigant in the court of justice and service opinion, should no authoritative reply be

made to this vehement arraignment, it will naturally be accepted as a true presentment of Mr. Daniels' record of pacifism, inefficiency and cordial dislike of the organization over which, unfortunately for it and for himself, he was called upon to preside. Let us hope for this counter argument, even if convinced that for direct thrusts, skillful parries and thrilling interest it cannot hope to rival Lieutenant Kittredge's work which is strongly commended to all naval officers for its exposition of fundamentally sound principles, entirely apart from the personalities to which it is committed.

C. F. G.

"Military Manpower." By Lieut. Colonel Lincoln C. Andrews, Cavalry, Retired. Price \$2.50. (Published by E. P. Dutton & Co.)

In military circles to-day, leadership is the call of the hour.

Unmistakably demonstrated in the World War, both in the case of our own personnel and wherever contact was made with our Allies, was the fact that in armed forces, the man in ranks was of the same basic intelligence as was the officer selected in command over him. With it came the recognition of another fact that former systems of discipline which prevailed—and were necessary—when the enlisted man was of inferior mental caliber were now obsolete. What is more, American armies and navies will for all time continue to be made up of the best fiber of the nation.

The fighting man of the future will be a thinking man and leadership of mind will be even more essential than leadership of body in the training of manpower for battle.

Colonel Andrews in the preface of his readable little volume, written primarily for use at the Military Academy, says:

"The late war has again proved that machines and cold science cannot win alone. They may test man's endurance almost to the limit, but in the end superior manpower wins."

Psychology is simply the knowledge of human nature and Colonel Andrews in his "Military Manpower" applies it to the training of men.

Leadership and the so-called "new discipline" are nothing new. It is the new applications which are causing such widespread interest in the services. A born leader had no difficulty with this new type of material which came to the colors when the call was made to take a stand against an enemy possessed of the most nearly perfected system of discipline the world has ever known. But even that was a discipline of force and the Allies had eventually to produce a better discipline before he could be defeated.

It is with this that the author has to deal—the development of a discipline of trained initiative based on intelligent and mutual understanding. The elements of the system are first analyzed and explained; then the principles of leadership are presented in detail; and finally, the application to actual training is interestingly set forth.

The subject matter is equally applicable to the young officer of the line of the navy. We readily recall how, in its expansion from 50,000 to half a million men, there poured into the navy, without conscription, the flower of young American manhood, commonly nurtured, which had to be differentiated into officer and man. All of this splendid material was imbued with a singleness of purpose and endowed with surprising zeal. And so it will be when the call comes again. We must, then, have even fuller appreciation of our responsibility in its training.

There are few born leaders, but experience teaches much and here is a little book which will be of undoubted value to any officer who would be successful in his task.

W. T. C.

"The Marine Turbine Power Plant." By Claude Cathcart Levin. Price \$3.00. (Published by the Ocean Publishing Company, 25 W. 42d St., New York.)

This is a small book of one hundred pages written, as the author says, "for the throttle pullers." The book is free from difficult reasoning and is expressed in plain simple language and non-technical terms; such that the operating engineer will understand. There are few sketches in the book, too few in fact, but this is overcome to some extent by the author's fortunate use of simple language. The book contains nothing original and is only a clear short exposition of the definitions of heat units and of the main features and elementary principles employed in the two types of turbines with their auxiliaries, as used for marine purposes, together with the B. & W. fuel-oil burning boiler and its auxiliaries.

A. A. C.

"The Blue Book of Oil Burning and Burners." By Claude C. Levin. Price \$2.00. (Ocean Publishing Co.)

This little book of 112 pages of clear, concise information is essentially a "practical handbook compiled for the operator of oil burners—in plain English," as put forth in the subtitle. It contains clear descriptions of standard installations, sufficiently illustrated by photographs and figures, many facts about oil and oil burning in a practical man's language and full discussion of the care and operation of oil-burning boilers in general and the Babcock and Wilcox boiler in particular, including safety hints. This book is very "readable," becoming terse and epigrammatical when discussing safety precautions and means of saving fuel. It omits little information necessary to burn oil economically and with safety, yet contains little of the superfluous.

C. C. S.

"The Gyroscopic Compass." By T. W. Chambers, B.Sc., A.M.I., Mech.E. Price \$4.00. (Published by D. Van Nostrand Company.)

The author rightly states in his introduction to this subject "that the gyro-compass represents to-day probably the most intricate and involved practical application of the gyroscope." Indeed, a very simple explanation

of the subject is impossible. It can be presented mathematically but in this form discourages those seeking the practical explanation of the theory rather than an exhaustive study of it.

The author has very ably, in his non-mathematical treatment of the subject, presented the principles of gyro-compass construction by using a simple demonstrating gyroscope. In the first six chapters, the several steps in the development of the subject are pictured by such modifications of this demonstrating gyroscope as are necessary to produce a gyro-compass that may be used at sea. In the next six chapters, explanations are made of the causes of the errors to which such compasses are subject under different conditions of service; and in the final chapters, brief descriptions of the various types of gyro-compasses in use are given.

The book should prove a valuable aid to those wishing to learn something of the theory of the gyro-compass.

H. D. McG.

"Aerial Navigation." By Lieutenant J. E. Dumbleton, late instructor in Aerial Navigation at No. 1 School of Aeronautics, R. A. F. Price \$4.00. (Published by D. Van Nostrand Co., New York.)

This is one of the first books for general publication on the principles and practice of aerial navigation, a science still in its infancy, though the methods and use of instruments have been covered by the "Manual" by British Naval Air Service; "Aerial Navigation Instruments" by U. S. War Department; and "Aerial Navigation" by Navy Department.

This book covers very clearly and completely what, to the naval service, is generally known as compass compensation, dead reckoning, and piloting as applied to aircraft. The author states that problems of astronomical observations are not introduced as their solution will not be required in aeronautics. It is possible that in the near future the stability of aircraft may be so improved that long sea lights will be common and observations of heavenly bodies with an improved bubble sextant or from low altitudes must be taken and solved by some ready method as Littlehale's, Poor's Line of Position Computer, or Brandis "Mechanical Navigator."

The author has devoted one chapter to maps and charts and one to meteorology. Use of course and distance indicator is very clearly given with numerous problems. Methods of interception of aircraft are given as well as use of the usual aircraft navigational instruments.

E. W. T.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

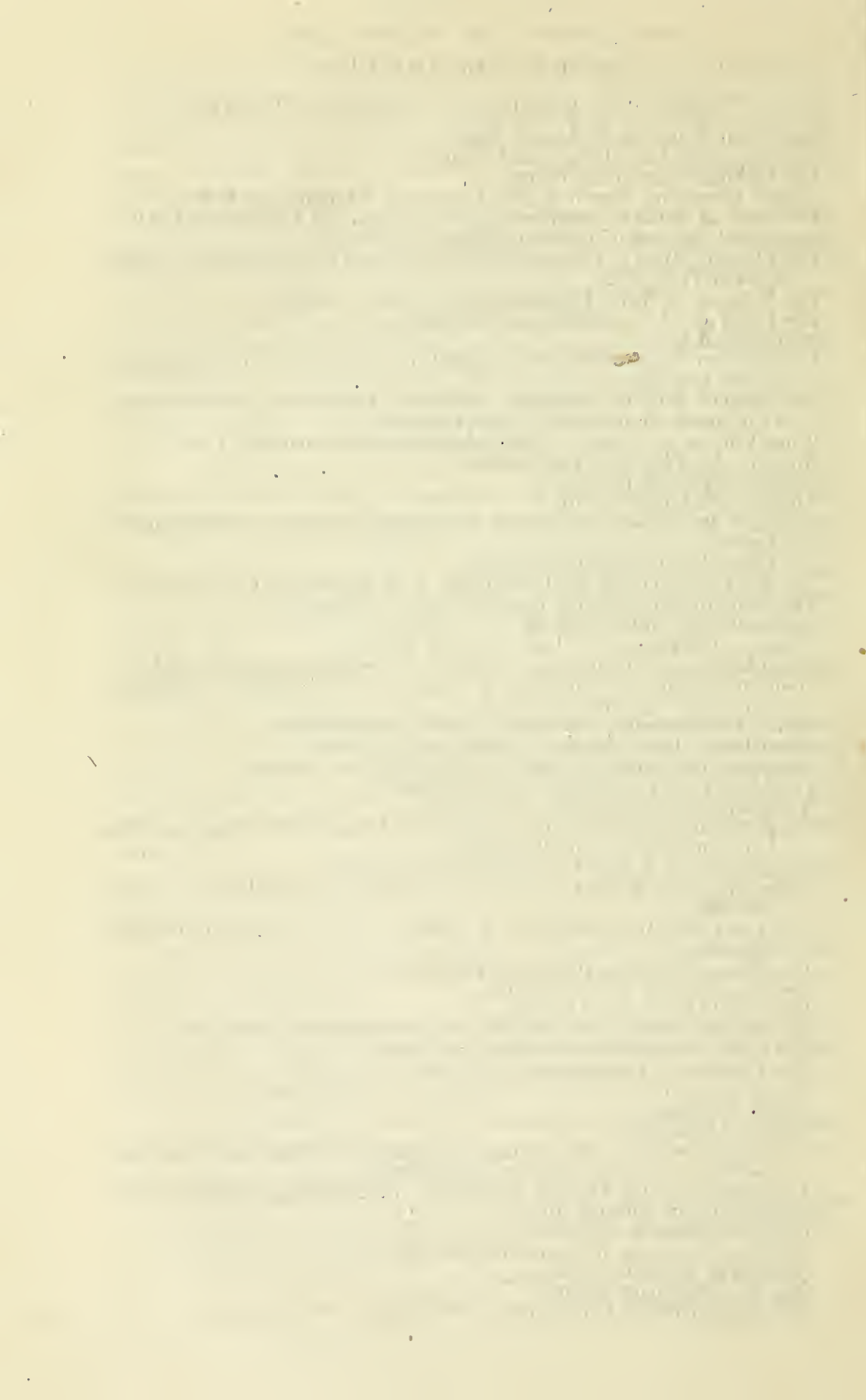
By direction of the Board of Control.

H. K. HEWITT,
Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.
The Navy: Its Past, Present and Future.
The Fighting Fleet of the Future.
Factors Governing American Naval Strength, Absolute and Relative.
The Navy in Battle; Operations of Air, Surface and Underwater Craft.
Escort and Defense of Oversea Military Expeditions.
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.
The Relation of Naval Communication to Naval Strategy.
The Influence of Topography on Strategy.
International Law.
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.
The Present Rule of Neutrality Regarding Contraband and Blockade—Is it Justifiable in Ethics or in Expediency?
What Will be the Status of the Submarine in International Law?
Aircraft—Its Place in Naval Warfare.
Aircraft, Practical Power of.
Aircraft Warfare, Laws of.
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.
The Control of the Sea from Above.
The Navy Air Service, Its Possibilities, Rôle and Future Development.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Surface Craft, Future Rôle of.
Armor or High Speed for Large Surface Vessels.
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.
Future Development of the Naval Shore Establishment.
Naval Bases, Their Number, Location and Equipment.
Strategic Requirements of the Pearl Harbor Naval Station.
The Navy Yard as an Industrial Establishment.
A Mobilization Program for the Future.
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.
Organization of a Naval Communication Service.
Scope of Naval Industrial Activity and the Navy's Relation of Naval Strength.
Social and Industrial Conditions in Relation to the Development of Naval Strength.
The Future of the Naval Officers' Profession.
The Naval Officer and the Civilian.
The Naval Officer as a Diplomat.
The Mission of the Naval Academy in the Molding of Character.
The Limits of Specialization in Naval Training.
The Training of Communication Officers.
Navy Spirit—Its Value to the Service and to the Country.
Morale Building.
Military Character.
Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.
The Influence of the Term of Enlistment on the Efficiency of the Service.
Shore Duty for Enlisted Men.
Physical Factors in Efficiency.
Health of Personnel in Relation to Morale.
America as a Maritime Nation.
Our New Merchant Marine.
The Adaptability of Oil Engines to all Classes of War Vessels.



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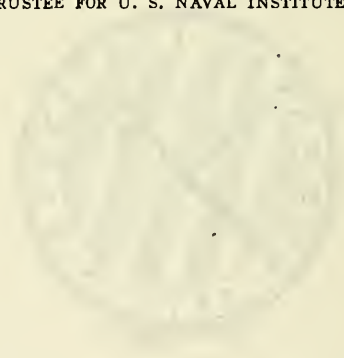
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CONTENTS

RECRUITING SALESMANSHIP. By Lieut. Commander J. Ogden Hoffman, U. S. Navy	825
A TACTICAL AWAKENING. By Commander John Stapler, U. S. Navy...	849
THE QUALIFICATIONS FOR LEADERSHIP. By Lieutenant (J.G.) C. C. Carmine, U. S. Navy	857
LOYALTY. By Rear Admiral R. H. Jackson, U. S. Navy.....	877
ELASTIC STRENGTH OF RADIALY EXPANDED GUNS. By Lieut. Com- mander W. H. P. Blandy, U. S. Navy	883
A MYSTERY OF THE SEAS. By James Morris Morgan	909
DISCUSSION	917
SECRETARY'S NOTES	919
PROFESSIONAL NOTES	923
NOTES ON INTERNATIONAL AFFAIRS	968
REVIEW OF BOOKS	976
INFORMATION INDEX	921

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RECRUITING SALESMANSHIP

By LIEUT. COMMANDER J. OGDEN HOFFMAN, U. S. Navy

Old-time sailormen talk of the days when the applicants for service in the navy always exceeded the demand and much excitement and competition would be caused by the display of a sign stating that "Two firemen, one seaman and one marine" were wanted. They picture a line forming, like an opera first-night, out of which were picked the two or three men, for whom there were vacancies, much to the disappointment of the other nine hundred.

Those must have been the halcyon days for the recruiting service, if there were any such duty worthy of the name, when all that they had to do was simply to "sit," without the added burden of being forced to think. They remind us of the rough photographs of Civil War times, with seamen old enough to be grandfathers, and be-whiskered gunner's mates leaning, with one foot crossed over the other, on the breech of an old smooth-bore, 12-pounder.

There certainly must have been a lot of romance in those times, and a life of gilded ease for the aforesaid possible recruiting service. Men went down to the sea in ships and stayed on them, never feeling really ill unless they had to cross a crowded street. Fortunately, everything moved along at the same slow, old pace, without taxicabs or electric cars to bring sudden curtailment to the mariner's rolling gait.

In this day of hurry, bustle, and, above all, business competition, the navy recruiting service is a real, live organization. It must

compete against other firms, just as though it were selling sewing machines, electric irons or fireless-cookers. It differs from its parallel in civilian life, only in that its salesmen do not receive a commission on sales, in actual money. At the very outset it must be remembered that it is absolutely different from anything else in the navy, that it must follow commercial methods if it wishes to succeed, and that its personnel, being paid only by the reward of work well-done, must have a very clear idea of all the in's and out's of the naval profession, and must master every detail of their particular branch.

The time has passed when an officer or man could look on recruiting duty as an easy means of spending two years ashore. If he sits back in his chair and waits for the recruits to come in, he will do just about as much business as the young lawyer when he first hangs out his shingle. He must go after them, pursue them, and run them to cover by the force of his personality until he makes them believe that his brand of goods is better than anything else on the market. He must entirely disabuse his mind of the assumption that his two years of recruiting duty are going to make him forget how to work, because he will work harder than he ever has in his life, although it will be of a different brand from that necessary in coaling ship, carrying stores or standing a deck watch. He will enjoy the privilege of learning to know his wife and children, if he possesses them, but the recruiting service has no room for the loafer, and wants only the man who will devote just as many hours a day to it as the emergency requires—it will seldom be less than eight, and often more.

At the start, a recruiting salesman must be convinced, personally, that he is offering a guaranteed, first-class business proposition, or else he might just as well stop right there and try another line of duty. He must believe in his own firm, and what it offers, or he does much more harm than good. In this respect, recruiting for the navy is no different than selling any commercial product, namely, that a salesman is useless unless his heart is in his work, and unless he is thoroughly familiar with the goods he is handling.

For the enlisted man, the recruiting school when in operation, lays the foundation of a recruiting education, the officer must devise his own methods, but neither of them can become good salesmen by what they learn at school. The education and study will familiarize them with many fine points of the trade, and give

them a knowledge of the various laws in the case, but to actually do the selling they must rely on their personalities.

Having briefly outlined the principles that should govern the spirit of the game, we will elaborate on the rules and various plans of action.

Every recruiting station requires, in its personnel, an assortment of natures, temperaments and qualifications. The whole force must work together as a well-organized team, but different sorts of men are needed for inside work, outside work, publicity and so forth. They must all be indoctrinated with the same spirit, but their educational qualifications may vary between wide limits. Taking into consideration the average recruiting district, with one main and five sub-stations, the personnel should be approximately as follows, to thoroughly cover the various fields of activity:

MAIN RECRUITING STATION

FORCE REQUIRED	DUTIES
1 Chief yeoman.....	Commanding officer's writer. Handles accounts and personal letters. Preferably a stenographer. Handles general reports.
1 Chief yeoman.....	In charge of outside office. Supervises preparation of records, of recruits for administration of oath, and prepares routine recruiting reports.
1 Chief petty officer.....	Information desk. Receives applicants, assists with preparation of applications, answers questions regarding eligibility and keeps record book of applicants.
1 Chief petty officer.....	Record desk. Makes out forms for allotment and War Risk Insurance. Prepares enlistment record, copy of substantiation of citizenship, obtains all necessary signatures of recruit and conducts him to recruiting officer.
1 Yeoman	Office files and transportation.
1 Yeoman	Publicity. (This subject will be later treated at length.)
1 Petty officer.....	Driver of automobile. Outside publicity agent.
1 Petty officer.....	Driver of motor-truck. Outside publicity agent.
2 Enlisted men.....	Outside publicity agents. May be attached to either automobile as a travel party.
1 Chief pharmacist's mate.	Assistant to medical officer.
1 Hospital apprentice.....	Assistant to medical officer.

SUB-STATIONS

- 1 Chief petty officer..... In charge sub-station.
- 1 Enlisted man..... Following-up applicants.
- 1 Enlisted man..... Publicity.

RECAPITULATION FOR DISTRICT

Main station.....	2 Chief yeoman.
	2 Chief petty officers.
	1 Chief pharmacist's mate.
	2 Yeomen.
	2 Petty officers.
	1 Hospital apprentice.
	2 Enlisted men.
<hr/>	
Total	12
Sub-stations (5)....	5 Chief petty officers.
	10 Enlisted men.
<hr/>	
Total	15
<hr/>	
Total for district.....	
27	

The duty to be performed by each of the men above listed is separate and distinct. Although several of the duties may be combined, in case of emergency or sickness, the work of the office invariably suffers, and to have men constantly changed from one duty to another, seriously impairs their efficiency.

The recruiting officer is, ordinarily, a disbursing officer, as well, to the extent of several thousand dollars a month, and his yeoman must, above all, be an accountant, preferably with experience in both the supply and executive divisions afloat. Routine work of the station, making reports, filing correspondence, and the correct accounting and substantiation of all disbursement require a very level head and considerable executive ability. The cash-accounting, purchasing of supplies and handling of appropriations is the same throughout the naval service. Whenever possible, vouchers must be obtained for every expenditure and payment must be made by cheque whenever the amount is greater than several dollars and the supplies may be carried on account. All bills must be "certified correct and just, payment not received," and signed by a member of the firm.

With the service afloat, however, the line officer is relieved of practically all duties involving the custody and disbursal of government funds. This phase of recruiting duty is, therefore, entirely strange to the average sea-going officer and if his yeoman is

not well versed in all of the intricacies of appropriations and allotments, the tour of duty will prove rather expensive for the recruiting officer. The auditor for the Navy Department is, perforce, a very rigid examiner, and accounts must be absolutely correct.

The subject of accounting comes too far outside the scope of this article to be touched upon more than very briefly. It should give food for thought, however, to those entering on recruiting duty, and cause them to devote considerable study to it.

The following is a summary of returns to be rendered, with the appropriations involved and the items coming under each appropriation. Recruiting reports are completely covered by instructions issued to recruiting officers by the Bureau of Navigation or the recruiting inspector of each division, to his division :

MONTHLY

Account current.....	Copy to Bureau of Navigation for examination and further transmittal to Bureau of Supplies and Accounts. Copy for station files. Copy for personal files of disbursing officer.
Abstract of appropriations chargeable.	Same as above.
Public bills	Same as above.
Status of monthly allotment..	Original to Bureau of Navigation, under separate cover. Copy for station files.
Supplies, with cost, from navy yards.	Same as above.
Statement of check-account..	Card form, to Treasury Department, direct.

QUARTERLY

Account current.....	Original to Bureau of Navigation, for examination and further transmittal to Bureau of Supplies and Accounts and Auditor for the Navy Department. Copy for station files. Copy for personal files of Disbursing Officer. Copy to Bureau of Supplies and Accounts, direct.
Abstract of appropriations chargeable.	Original to Bureau of Navigation for further transmittal as above. Copies as above.
Public bills	Originals, with substantiating vouchers attached, to Bureau of Navigation, for further transmittal as above.
NOTE.—All vouchers in triplicate, one retained for station files and one for Disbursing Officer.	

A main recruiting station that is really alive is completely organized as would be any up-to-date business house. It is a very true adage that "What is anybody's business is nobody's business," and in order to avoid this easily established stumbling block, the present scheme covers all of the principal duties. Circumstances will constantly arise, due to sickness, leave of absence, and so forth, where the organization must be consolidated, but every detail should be covered, and each man taught the work of at least two units. The three main divisions are: "Inside office," "outside office" and "publicity." The medical department, with a responsible officer of that corps in charge, takes care of itself.

(a) INSIDE OFFICE

(1) *Accounts*.—A world of study that has been briefly touched by the foregoing notes.

(2) *Transportation*.—The yeoman in charge of this department must familiarize himself with most of the duties of a general passenger agent, and combine with the above the handling of transportation from the point of view of the government. He must learn, by heart, the principal and shortest routes to all points of naval concentration, and keep on hand a library of the latest timetables. There will be only one or two trains a day, on which it is customary to send recruits or men re-enlisting, and if the yeoman has, before him, a brief of their schedules, a great deal of time will be saved. When the transportation yeoman has completed the transportation voucher and transportation report, he should turn them over to the accounting yeoman who issues the cash necessary for meals en route, transfers of baggage and other necessary incidentals of travel. Requests for checkage of men's accounts for cash furnished with transportation are no longer required, but receipts for all cash must be taken, with a statement of the reason for each issue. In this connection, it may be mentioned that examples are constantly presented of men who have been furnished inadequate funds for cash payments. Such occurrences cause hardship on the men concerned and reflect discredit on the naval service. The various allowances are plainly tabulated and if too much money has been advanced, the man must refund it in accordance with instructions on his transportation report, so the government will not lose, in any case. The shortest practicable route must be employed and the officer issuing transportation is respon-

sible for its selection. It therefore pays to carefully study the connections between the recruiting station and various receiving ships, etc., as there are several wrong routes for every right one. If the yeoman is forced to run his finger the length of a dozen time-tables, and the recruiting business happens to be booming, the outer office will be filled with a crowd of impatient and often disgusted recruits. Such a state of affairs not only gives men a false impression at the outset of their naval service, but might easily cause applicants to seek some other employment, where such inefficiency did not prevail.

(3) *Files.*—There is nothing more satisfactory than a good filing system, and nothing more maddening than to have to spend valuable time in search for a letter, of which everyone remembers the existence but no one can find. To design a filing system is beyond the scope of this article, and a large-sized volume might be devoted to the subject, but a few cardinal truths may be mentioned to advantage. The secret of any good filing system is simplicity coupled with order. As regards disbursing* returns, "safety first" should be the motto, and every disbursing officer should jealously guard a personal copy of his returns, from the day that he takes charge until he relinquishes it. No matter how many auditors serve in that capacity for the Navy Department, any one of them can open an account that has been closed by a previous incumbent, and there is no such thing as a dead account, as far as the responsible officer is concerned. The proof, for or against, is all in his hands, and he should preserve it with his most precious documents. In regard to the filing of letters, reports and so forth, it may be mentioned that no two minds will work in exactly the same channels, but that several minds may be indoctrinated with the same ideas. Six people may file letters under as many subjects, if they are not taught to grasp the predominating note in any text. The actual system employed matters but little, as long as the man in charge understands it thoroughly and assumes the point of view of the designer. The outcome must be a clean desk at the end of every day. *To-morrow never comes.*

(b) OUTSIDE OFFICE

The men who receive the applicants for enlistment and subsequently prepare them and their records for enlistment and transfer,

must develop sufficient clerical ability to fill out, correctly, the various forms, telegrams and routine reports.

For the above reason, the man in charge has been designated as a chief yeoman, although it is not absolutely necessary. Clerical exactness, however, matters considerably in the contentment of the office force, and may draw a man of previous naval service to one particular recruiting station, rather than to another, if he knows that at the former he will be re-enlisted with despatch.

All of the outside force, however, must, above all, be diplomats and have agreeable personalities. A lad joining the navy is naturally diffident, and the manner of his reception often makes the difference between gaining or losing a recruit.

If the applicant is rejected and curtly dismissed, either with scorn or without consideration for his disappointment, the navy has made a decided enemy. Every applicant can be made a friend of the navy, whether or not he succeeds in passing the examination for enlistment, and, furthermore, he can be made an active recruiting agent, and a most effective one. One system that works very well, is to have every applicant write on a suitably ruled card, the names and addresses of some of friends, whom he believes are over 18 years of age and suitable material for the navy. If he is informed that these names entail no obligation upon himself, and that a number of fictitious names and addresses will only give an added burden to the recruiting service, it will be found that he enters into the spirit of the game, and opens sources of information that would, otherwise, have been closed. The use of these cards will be further explained in detail.

If the applicant fails to pass, due to some physical defect, he will be downcast and in need of sympathy. A cheerful word, even if it does not cause him to correct the defect, which is sometimes possible, will invariably produce results. He will tell his friends of the treatment he has received, be it good or bad, and the navy will be agreeably implanted in their minds. Many young men would apply for enlistment if they were not afraid that from the moment they enter the recruiting station, purely to seek information, they became, in some way, obligated to "go through" with it. Every applicant who is courteously received, helps to dispel this fallacy.

The organization of the outside office, normally consists of the following three headings. When recruiting is rapid, three men are

required, but the duties can be concentrated in case of emergency or slack business.

(a) *Information*.—Answers the multitude of questions that make up the day's work, directs the writing of applications and determines the branch of the service for which the applicant is best fitted. Verifies the substantiation of citizenship of the applicant, and sends him to the medical officer with application correctly made, with birth certificate attached. The man performing this duty should be thoroughly familiar with naturalization laws and capable of detecting alterations or deficiencies in substantiating papers.

The above duty requires the highest type of sales ability, and it is the most important post in the recruiting district.

(b) *Records*.—Takes the accepted applicant, from the time he leaves the hands of the medical officer, and executes all forms pertaining to enlistment, with the exception of medical record. These include: Service record, applications for allotment and insurance and shipping articles. Files office copies of records, application and substantiation of citizenship, and conducts applicant to recruiting officer for administration of the oath of allegiance. The above man should also obtain sufficient notes of the career, education, etc., of the applicant, to furnish the basis for a newspaper article, and obtain from him the names of some of his friends, for the use previously stated. This post requires clerical ability and a thorough knowledge of existing rates of pay and additions.

(c) *In Charge*.—Preferably a chief yeoman, although either (a) or (b) should be capable of performing his duties in case of emergency. Has general charge of the outside office, and prepares necessary reports and returns as follows:

Daily: Report of enlistments (N. Nav. No. 4). Quadruplicate. Bureau of Navigation; two copies to recruiting inspector; copy for file.

Daily or when occurring: Reports of transfers and receipt of men. (Form N. Nav. No. 8) Duplicate. Bureau of Navigation, and file.

Weekly: Report of enlistments by ratings (telegraphic), Bureau of Navigation and recruiting inspector. Written report, letter form containing same information in further detail, Bureau of Navigation and in duplicate to recruiting inspector.

Weekly: Report of applicants, failed to report and enlisted. Duplicate to recruiting inspector; copy for file.

Weekly: Insurance. Quadruplicate. Bureau of Navigation; duplicate to recruiting inspector; file.

Semi-monthly: Reasons for enlisting. Duplicate for recruiting inspector; file. (15th and 30th.)

Semi-monthly: (N. Nav. No. 25) Report of vacancies. Quadruplicate. Bureau of Navigation; duplicate to recruiting inspector; file.

Every 4th week: Report of enlistments, letter form. Age and service of recruits. Bureau of Navigation; duplicate to recruiting inspector.

Man in charge checks entries regarding pay, etc., in service record, collects records for signature of recruiting officer and sends reports and records to their destinations.

Men enlisting for trades must be examined by the recruiting officer, and their qualifications should be determined shortly after they enter the office, so that there will not be the slightest delay in executing the successive steps.

If the outside office is properly organized, it should be as easy to enlist fifty men, or a hundred, as it is to enlist five. With three separate desks, and lines of demarkation between the duties of the personnel, there should be a steady flow of men from one desk to the other. Aside from the time that is expended in helping an applicant to decide his fate, the complete process of enlistment, from the time a man enters the office until he leaves it, should be considerably less than one hour. Nothing counts as much with an ex-service man as the rapidity with which he may be enlisted and, aside from reasons of expediency, there is no better business asset for a recruiting station than speed and accuracy in the outside office.

(c) PUBLICITY

To spread the advantages of the navy before the public is the most important objective of the recruiting service, and all members of the personnel should co-operate to this end. The various standard methods may be summarized as follows:

- (1) Posters.
- (2) Moving picture reels and slides.
- (3) Personal advertisement and solicitation.
- (4) News articles.
- (5) Mailing lists.
- (6) Speech-making.
- (7) Miscellaneous.

(1) *Posters*.—The Navy Recruiting Bureau has a large establishment that furnishes, periodically, advertising matter to the various recruiting stations. It is impossible for them to keep pace with the unlimited demands of the whole service, and it therefore

devolves upon individual stations to exercise their own ingenuity and create advertisement of local value. It is always possible to spend a small amount of money from the station allotment, and special allotments can be obtained in nearly all cases where the occasions demand them.

The business of "sticking-up" posters is really the source of much amusement and the personnel, once initiated into the game, are usually more than willing to spend all their time at it. There is always the possibility of being arrested, while in the attempt of spreading this form of publicity, which adds a little sporting zest to the pursuit. Nearly all business concerns will, however, lend their assistance and co-operation if properly approached. This is particularly true where the navy poster is an attractive pictorial, which in nowise detracts from any other advertising matter that may be on the spot. The business of wrapping a poster around a telegraph pole is a trifle risky, but, sometimes, the location is so strategically perfect that the impulse simply refuses to be denied.

It is an advertising scheme, first and foremost, and, in this connection, advantage should be derived from all local catch-words and phrases. The wording of a poster being, primarily, intended to arrest the attention of the passerby, must not be too detailed, and salient facts must be stated briefly, concisely and in unusually forceful language. Unnecessary verbiage is simply confusing to the reader of the poster, and it is much better to err on the side of having too few words, gaining in "point" what we lose in "volume." Many advertisers fail to realize that the location of the main point of their message varies considerably in value, depending on its location relative to the body of the sheet. An advertisement in the upper right-hand corner of a news sheet or paper, for example, is worth more than twice an advertisement in the lower left-hand corner, and an advertisement in the middle of the sheet carries more weight than one at the top or bottom. This is not a matter of mere guesswork. The relative values of every part of the sheet have been established by psychological tests, as any standard text-book on the science of advertising can demonstrate.

There are three cardinal facts to be borne in mind with regard to bill-posting. These are: (a) The text; (b) the location; (c) the number of posters placed in any one location.

(a) *The Text*.—In framing a poster, the heart of the reading matter, the gist of the message, must be given the most valuable

place on the sheet, and must be in the largest type. If the subject occupies more than one line, it must be divided at the top, middle and bottom. In addition to relative location, "contrast" enters into the game, and the type above and below the principal features should be small and, if possible, of a different color. A poster that is to be placed on a street car or other moving body requires the maximum information in the minimum space, and if the poster contains matter that cannot be read at a glance, it will be lost to all but a very small percentage of the readers. The size of poster used on street cars, an excellent advertising medium when they can be obtained, is 21" x 22", or quarter-sheet. A poster of this size is easy to paste in any location and it is, therefore, a useful size for general posting as well as on the moving car. If it is to be used for both purposes, small text should be used in conjunction with the large type, but one must not interfere with the other. The average man passing this poster on a fence, for instance, will read only the large type. If he is interested, however, and if the large type is sufficiently forceful to excite his curiosity, he will stop and read the poster from top to bottom. This will also apply to the man who is waiting for a car, and reads the poster on other cars, as they come to his corner and take on and discharge passengers.

With posters, the principal feature of which is a colored picture, little text should be included, and the converse is true of text posters. These two types attain their maximum value when associated together, a colored picture, with informative type on either side. The passerby is attracted by the picture, and while he is looking at it he becomes interested in the posters surrounding it.

(b) *The Location*.—Before posting virgin territory, a careful survey should be made of the terrain and notes made of the locations that draw the greatest number of people. These are naturally the points where a poster would be of the greatest strategic value, and the principal displays, bill-boards, exhibits, and so forth, should be so placed. The posting in any one city should be so distributed that the entire territory is covered, and the only way in which this may be accomplished is to divide the territory into zones, the principal thoroughfares being the boundary lines. The small, cross streets are of little moment, as, if the zone is practically surrounded by a chain of posters, everyone in that zone will have the navy placed before them unless they are bedridden invalids. The usual tendency is to have a thick display of posters in the business center

of the city, and in the vicinity of the recruiting station, and to forget the outlying sections. Displays should gradually concentrate as they approach the recruiting station, but the city should be posted to its extreme limits, and the highways leading to the next city, intermittently posted.

Where the location of posters may be considered as permanent, a "poster station" should be established, recorded, and receive a systematic inspection to see that the display is in good condition. To facilitate inspections, the poster stations should be numbered chronologically as they are established, and further recorded by zones.

(c) *The Number of Posters in Any One Location.*—There is much difference of opinion regarding the number of posters, in any one place, that attains the maximum advertising with the minimum waste. From psychological experiment it has been demonstrated that four posters placed together are of much greater value than four placed at random, and, following this line of reasoning, there is no waste in placing four posters in a continuous line. Placing more than four, in this manner, would probably be a waste of material. This only holds good where the posters are of the "type" variety, as a brightly colored picture is merely to draw the eye, and gives little information. To place more than one of the latter variety would be of no greater advertising value than a single sheet. If we want a larger spot of color we should increase the size of the sheet rather than the number displayed.

It is easy to see the effect produced by a line of similar type-posters, by posting a fence, in this manner, and watching the passing crowd. The passerby will read the first line on the first poster, the second line on the second, and so on. If the matter interests him, he will stop at the last poster and read it from top to bottom. If there had been only one poster, he would not have had either the time or the inclination to read it in passing. This is based on the same reasoning as the electric sign that gradually adds to its display until the entire sign is illuminated. It is then extinguished and starts over again. The observer's interest is kindled by his curiosity as to what is coming next, just as it is by a chain of posters, if the initial wording is at all clever or unusual.

The navy can do no better, in this matter, can to follow the lead of concerns handling marketable products. Their advertising is conducted by experts who have made it a life study.

(2) *Moving Picture Reels and Slides.*—Short of the display of an actual bit of the navy, such as a ship or naval station, there is no more effective way of placing the matter squarely before the public than through the medium of the moving picture screen. In this day and generation it reaches more people than all other forms of advertising combined, and their interest is held by what preceded and follows it, whether or not they are drawn to the naval display in particular.

For use in theatres, single reels are much preferable to features comprising several reels, as managers are always willing to place the former, whereas their programs are too exacting to permit of the introduction of three or more reels of navy pictures. A single reel, coming to them at no cost, will often tide them over a slight gap in their current program, as it is often difficult for them to obtain a single commercial reel.

With the adoption, by the recruiting service, of their own moving picture apparatus, serial pictures are valuable, but they are at a disadvantage in the commercial field, where it is often necessary to break their sequence by taking a single reel from the series. If the public see "The Making of a Man-of-War's-Man, Part 6," on the screen, for instance, without the other five parts, they feel cheated, although the manager who is under contract with moving picture distributors, cannot possibly find time to show the entire six reels. Civilians always have the impression that the recruiting agent is simply trying to get a lot of publicity without paying for it. Of course, they are right, although it is a case of not being able to pay for it, rather than not wanting to, but it devolves upon the recruiter to make them feel that they are really the gainers, rather than himself. If any recruiting station is so fortunate as to incur the obligation of a manager by helping him when his program is held up by traffic conditions, it will have no further trouble, from that manager, at least.

The manufacture of moving pictures is a most expensive business, but it certainly warrants greater activity than any other form of publicity. It shows the navy to the people as nothing else can in the undisguised revelation of a camera.

Managers are always glad to show stereopticon slides, although they prefer to get them a few at a time. Excellent pictorial slides can be reproduced from the weekly "What the Navy is Doing" supplied by the Navy Recruiting Bureau. The pictures can be

effectively photographed on a plate which, with the addition of the address of the recruiting station, makes a pleasing as well as business-like slide. With a new picture added to the collection, every week, the theatres are given plenty of variety and slides can be constantly shifted from one theatre to another.

Whenever any particular news comes to hand, such as the navy pay bill, the anticipated visit of a large naval display, etc., a very good slide can be made on the typewriter, lifting the ribbon and cutting a stencil on a piece of thin stencil mat. Carbon paper can be used, but with the former the letters are more clearly cut and circular letters are preserved in their entirety.

(3) *Personal Advertisement and Solicitation*.—We now come to the most important factor in recruiting and the backbone of its success. Posters, moving pictures and stereopticon slides are, after all, only rigid forms of advertising and are, at best, mute appeals to a man's curiosity, his desire for travel, or his business instincts. None of them can answer the many questions that arise in the mind of the observer, and the information contained in all of them must, perforce, be very brief.

All forms of advertising are valuable, and none of them should be discarded until their failure has been definitely established, but the man in uniform, thoroughly indoctrinated in recruiting salesmanship, can accomplish more in a few minutes' talk than several hundred posters. The recruiting officer dreams of publicity so perfect that navy posters meet the eye of the passer-by no matter which way he turn, and which he is bound to see unless he be a cripple or totally blind. In actual practice, however, posters will be few and far between except in certain localities where the conditions are ideal, and the owner of a half-mile fence happens to share the bill-poster's enthusiasm.

The real, live sample of the navy, his eye continually open to the main chance, his brain stored with navy lore, traditions and facts, and thoroughly drilled in the practical manner of making a sale, is what the recruiting service needs and what it must have if it is to compete with civilian business. Commercial organizations spend large sums in advertising, but they also maintain a large corps of salesmen whose incomes are directly commensurate with their selling abilities. A salesman, no matter what he is selling, reflects credit or discredit upon the concern he is representing by his appearance. This is a thousand times more important for the navy

salesman than it is for the civilian as, after all, the civilian is only asking that his goods be bought, without the added requirement that the purchaser live the life that has brought the salesman to his present station.

An officer or petty officer, purporting to be a representative of his service, who is slovenly in his appearance, is not taut about his clothes, or forgets to shave, may easily sway the balance against the navy or render null and void all the impression that has been gained by the poster or the illustrated booklet. There is a constantly increasing interest shown by the parents of our future navy and, with them, appearance counts a great deal more than it does to their sons. Neatness, in a recruiting agent is, therefore, not advisable but obligatory.

Salesmen can only be judged by one standard—the *results* they produce, and the only tangible unit is the enlistment. The market is there, better, to be sure, in some places than it is in others, but it is there, nevertheless, and the only way that a salesman can make an impression on it is by constant and unremitting work and devotion to his task.

As he gains in experience and skill his sales will increase and the novice who thinks that the business can be learned overnight has only to be put to this work, to be rapidly disabused. Every single waking moment must he be up and doing, and have the answer to every question at the tip of his tongue. His sale must be scientifically conducted, he must develop instinct in sighting a "prospect," and he must be able to combat every argument.

"Personal solicitation," as a topic, is no empty title, but means exactly what it says. The salesman must do the soliciting or some other business gets his possible recruit. He must go after his business as though his bread and his family's clothing depended on it. He must search the highways and byways for business and not wait for it to drop in his lap, or he should find his footsteps leading sea-wards and a more energetic man taking his place.

(4) *News Articles*.—Newspaper editors are, really, very long-suffering individuals. They are imposed upon as long and as often as the public can accomplish it and as they will permit. They receive, several times a day, reams of stuff that has no legitimate business except in the waste-paper basket, and they are constantly hounded by those over them to reduce the size of the paper and help combat the paper shortage.

There is only one answer to the question: "What will they publish?" and that is "*news*, of local interest, if possible, and what the *public wants*."

There is absolutely no point in sending them a half-column of navy advertising, disguised as a story, as they will simply give it one pitiful glance and throw it away. After they have done this a few times they will throw envelope and all away without taking the trouble to examine the contents.

If we discover the fact, however, that Mrs. Jones' son John slipped and bumped his head, the editor will accept it gladly, as all of Mrs. Jones' friends read the Daily Bugle and will be interested to hear of John's accident, or grieved, as the case may be. If it happens that John enlisted in the navy there is real foundation for a story for his *local* paper. The biggest paper in our district, probably in the town where the main recruiting station is located, will be satisfied with John's name and address, and the fact that he enlisted and this information they will always publish. The small-town editor, John's *home* scribe, will eat up the details, and give him as much space as the other paper would allot to a first-class fire.

We should, therefore, syndicate all of the papers in our district, making our list absolutely complete, whether some of the papers are published only weekly or semi-weekly. They are all vitally important and the editor of the country newspaper is as important, in his way, as the president of the Associated Press. Every enlistment should be reported, as part of a summary to the important paper, and as an article to the small one. If the applicant is a resident of the big city, a few facts may be added to the statement of his enlistment, but they must be very brief.

In addition to the above press stuff, which should become a part of the office routine, many occasions present themselves for legitimate articles, with enough news to suit the public. The proposed visit of a ship of the navy, detailed information after she has arrived and a sketch of the commanding officer and his naval career.* Information as received from the Bureau of Navigation of interest to all ex-service men in the district, or activities in which any local celebrities have a part.

In fact, there are countless ways in which the navy may appear in print to the mutual benefit of the editor and the public. Articles of general interest should always be sent to all papers in the dis-

trict, and articles of local interest to the paper of the locality concerned, only.

In all items issued from a recruiting station, the recruiting officer or a member of his personnel should be quoted as supplying the information in question. Editors never like to assume the responsibility for statements concerning the navy, and if there are frequent interspersions of "the recruiting officer of the blank district states," or "Chief Machinist's Mate Bill Jones of the local recruiting station says," there is no chance of a come-back at the editor, and the editorial is in such form that it will not require much re-casting.

It should always be remembered that the editor has less of time and space than he has of any other commodities, and if we can place our articles in such form that he can hand it to a copy-boy without cutting out about three-quarters of it, our stock will be in the ascension.

(5) *Mailing Lists*.—A recruiting station can become a first-class mail-order house if this important activity is given proper attention. The possibilities depend, of course, on the equipment and the available personnel, but whether there is on hand an addressograph or whether all envelopes must be addressed by typewriter, a mailing list is absolutely essential if intensive recruiting is to be accomplished.

If a brand-new list is being established we can always obtain plenty of material from patriotic organizations such as the American Legion and Veterans of Foreign Wars. This will give us several thousand names as a starter. We can follow this up with information obtained from the census bureaus, employment agencies, and "hiring-and-firing" departments of large industrial concerns.

Next to the above, and other similar sources of names in quantity, applicants for enlistment, themselves, are the most prolific source. Very few men seeking information about the navy fail to produce the names of, at least, two or three of their friends whom they think might be interested. The best time to obtain this information is at the time the man is filling out his own application. His mind is then concentrated, he has a pen in hand, and it is much easier to direct his thoughts in this direction than at any other stage of his progress through the recruiting station.

To carry out the above plan, it is convenient to have a small card or printed form, bearing the following legend, or something similar thereto :

The following are, to the best of my knowledge, citizens of the United States, over 18 years of age, and would be interested to know about the navy, as applied to their particular cases.

Below this appears space for four or five names and addresses. It is also a help if the applicant is requested to write on the back of the card very brief notes about each man, to give the writer of the prospective letter some inkling regarding the man's qualifications and present occupation.

This system has been used to the greatest success, not only with applicants, but with every member of the recruiting personnel in the field. Each recruiting agent should submit a daily report on his activities, similar to that required in any concern employing bodies of salesmen. On this report is entered the names of all men interviewed, with the exception of those actually brought to the recruiting station and enlisted.

The names obtained from all sources are summarized for the day, passed to the publicity office, and a letter is sent to each man, worded to suit *his particular* case. There is nothing that tickles a man's vanity as much as to receive the impression that someone else is interested in his particular case as separated from all other cases. As the navy embraces practically every trade, so it has the answer to every man's question, and if such a letter, beside giving the advantages of the service in general, states, explicitly, what it can do for the recipient, he is bound to read it from beginning to end, and give it serious thought.

In many cases, particularly with the men whose names have been obtained from applicants, we have no information except their names and addresses, and the only solution is a form-letter, so worded as to avoid the appearance of a "form," and made as straight-from-the-shoulder as possible. As the work progresses we can develop numerous form-letters, to suit men of different walks of life, men who have had previous military or naval service and men who have not, but all of them should, whenever possible, be signed by the recruiting officer. It is somewhat arduous to sign several hundred letters a day, but it makes all the difference between a personal and an impersonal message. A good multigraph

with a signature attachment can do the work pretty well, but nothing fills the bill as well as pen and ink.

A mailing list has almost infinite possibilities, and the results obtained from it will be gradually accumulative. It should be paralleled by a card-index system, which should be kept strictly up to date. It takes some time before the results are apparent, but, once in full swing, 25 per cent of the weekly enlistments should appear in the files.

With all the modern appliances for producing letters and addressing envelopes, the mailing list may gain in sheer weight what it loses in the personal element, but it is believed that quality is preferable to quantity.

(6) *Speech-Making*.—The opportunity should always be sought, and it often arises of its own accord, of addressing bodies of men on the subject of the navy in general.

It is manifestly impossible to reach such a perfect dissemination of information that all males between the ages of 17 and 35 and, in particular, those who have had military or naval service, hear our message. The best we can accomplish is to talk to them singly or in groups, and the larger the group the better. Every man, woman or child is a good subject as what does not apply to the individual case will always be passed along to at least one other person.

With the business proposition that the navy offers to-day, it is certain that everyone not permanently established in a lucrative position is bound, in his own self-interest, to listen to it when it is expounded. Every recruiting salesman should, therefore, have in his mind several short addresses on the navy suited to different types of audiences. These must not be stereotyped, but should lead right to the point and follow a line of appeal commensurate with the intelligence of his listeners.

In order for the delivery of a speech to be effective no oratory is required. The talker must simply know his subject and have a sufficient control of language to drive home his point. He must not deal in innuendos and must not say anything that he cannot prove.

The first point is to "size-up" the audience and then talk about what would interest *them*. Just as the first point in salesmanship is to find out what interests the customer, so in the making of speeches the attention of the audience is of paramount importance. Once it is lost, the best thing to do is to drive home one or two vital points and close the argument. Briefness, conciseness and a dic-

tion that will reach to the limits of the audience, and of which every word can be understood, are the prime essentials. Use the simplest words that will express the intended meaning, do not hurry but keep the talk from dragging.

There is not believed to be any exaggeration in the statement that everyone in the United States is interested in the navy. The navy is at the back of the heart of every American citizen, and it is not simply mob spirit that prompts the hand-clapping that always greets the appearance of a man-of-war on the screen. If there is any fault to find with the spirit of the public in its relation to the navy, it is that, individually, people are more enthusiastic about the navy in the abstract rather than in the concrete. The American mother is more often enthusiastic about seeing some *other* mother's son in uniform.

The reason behind this state of mind, and which we must strive to counteract in our speeches, is believed to lie in the enormous fund of inaccurate knowledge that has spread from one end of the country to the other. The recruiting petty officer with the badges of long service on his sleeve, has many opportunities to dispel much of the mystery surrounding his service and, most of all, to counteract the influence of the man who has been all of six months in the navy, was discharged with bad conduct, and is regarded as a prophet in his own country.

It is impossible to call to mind any other profession that is so subject to the damning influence of a "little knowledge," which is never more dangerous than it is in this connection. Neither facts nor figures ever lie, and the incontestable argument is at the disposal of every officer and man in the service. He who is ashamed, afraid or too modest to use it, has no business on recruiting duty.

(7) *Miscellaneous*.—Every phase of recruiting publicity depends for its success upon seizing the main chance and, moreover, watching for its approach. Any proposed gathering affords an opportunity of placing the navy before the public, be it in circus parade, bicycle race or prize fight. The daily papers should be closely scanned and are of the greatest assistance and the recruiter should always have his "ear to the ground."

It is particularly true in the United States that novelty is the keynote of any advertising scheme, and the business of advertising the navy requires considerable variation to keep it from going stale. Aeroplanes are a comparatively recent venture, but the

country has always had its navy, and is inclined to treat it, more or less, with the contempt that is bred by familiarity. To make the public take notice of something that has always been there, like the sun or the moon, dynamic advertising is required and should be carried on, within the limits of good taste.

• SUMMARY

RECRUITING SALESMANSHIP

Recruiting activities, as undertaken at the present time, require a fixed doctrine and a standardized method of approach. Times have changed, intensive operation is mandatory, and all men coming to recruiting duty, under the present régime, must disabuse their minds of any systems, methods, or plans of campaign to which they have previously adhered. In this connection we would prefer to have men of no experience, men who are willing to learn a new system in a new way, and all that is required is an agreeable personality and a willingness to accept the established doctrine, whether or not it agree with their own ideas on the subject.

One doctrine and a single method of procedure will, if properly established in the service at large, effect much greater results than innumerable systems practised at the volition of the individual. We will, therefore, assume the adoption of a doctrine as herein-after outlined.

(1) *Salesmanship*.—To “sell” an enlistment in the navy is no different than the marketing of any tangible product, and the fundamental success of all salesmanship is based on the inherent principle of *selfishness*. Every individual is more interested in his own affairs than he is in the concerns of his fellow men, unless he be a minister of the gospel and, even then, it would be difficult to prove the contrary. He may appreciate the interests of his friends, will listen politely while they expound their theories and will exhibit deep sympathy at their troubles, but, when it comes to the final analysis, it is his *own* business that directs his conduct. Hence the very foundation of salesmanship: *Look at the proposition through the other fellow's eyes*.

To sell a psychological proposition like the navy is more difficult, in one way, than to sell a mechanical toy, a sample of which we carry in our pocket; but, viewed from another standpoint, it is much easier from the diverse fields of interest that it covers. An

electric flatiron interests only a housewife, or a man who deals in such articles, but an enlistment can be made of interest to any man, of any trade, between the age limits and, moreover, to those interested in his welfare.

There are two prerequisites of salesmanship and two only. These are:

- (a) An absolute knowledge of the line of goods.
- (b) Confidence that the line of goods that one is handling is better than *anything* on the market.

Before sending our salesmen on the road, we will, therefore, assure ourselves that they have the necessary requirements of an exhaustive and detailed fund of information regarding the navy, and the conviction that it is the best proposition in existence.

(2) DOCTRINE

The sale must pass progressively through the following stages:

- (a) Attention.
- (b) Interest.
- (c) Desire.
- (d) Conviction.

- (a) The prospect must be attracted to our product.
- (b) It must appeal to him and hold his interest.
- (c) He must be made to *want* it.
- (d) He must be convinced that unless he possesses it he will never realize the ultimate success from life.

Our *doctrine* requires that the four cardinal points be *always* covered in the same order and that each be fully covered before the succeeding one is opened.

It makes no difference whether the applicant is encountered on the street, is met at the railroad station or walks into the recruiting station, the *doctrine* holds goods.

Unless the line that interests him *most* is determined at the outset, the sale may be landed, but it will be more good luck than good management.

(3) THE BAG OF TRICKS

1. Travel in a way that only the very rich in civil life can afford.
2. Learn a trade in better schools than exist in civil life.
3. Athletics and recreation, provided and systematically supplied by the government.

4. Assured promotion and *always* room at the top.
5. Healthy life. *You* get free the greatest cure for all ills, the air of the open sea.
6. The only concern in the world that gives a man money to spend, allows him to spend it *all*, and provides him with an income for the rest of his life after 16, 20 or 30 years' service.
7. Life or endowment insurance at rock-bottom prices.
8. Free food, lodging, recreation, medical attendance and clothing.
9. A steady job, whether outside business is good or bad.

(4) THE RECRUITER'S KIT

- 1 small handbag, similar to a brief case.
- 1 small note-book and pencil.
- Local time tables.
- 1 pocket street directory.
- 3 each trade pamphlet.
- 1 copy of all the very latest information on enlistments, trade-school, rates of pay, etc.
- 1 copy of recruiting instructions.
- 1 arm brassard.
- 1 assortment of photographs of trade-school, ships, etc.

(5) THE RECRUITER'S CREED

I will keep my eyes open *every minute* for a likely prospect.
 My constant thought will be "What can I do for recruiting, *now?*"

I conscientiously believe my proposition to be *better* than anything on the market.

Is there anything that I do not know about my line?

My personal appearance will always be above reproach.

I will never make any statements that I cannot prove.

I will follow the *doctrine* in making every sale.

I will never lose my temper.

I will never lose my sense of humor.

In selling my goods, I will *never* be ashamed, and I will be afraid of neither man, God, nor devil.

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A TACTICAL AWAKENING

By COMMANDER JOHN STAPLER, U. S. Navy

The question is, is the navy awake to the importance of complete tactical knowledge and co-ordination in every form of battle effort?

The decisive fleet action of to-day bears so directly on national destiny that failure to properly combine every type of weapon should be securely guarded against.

The World War has contributed a remarkable advance in all classes of ships, both sea and air. The gun, torpedo and mine have laid down new restrictions on battle movements. Modern sea action with its high speed and increasing number of distinct types of ships and weapons has become a complicated problem. The relatively simple requirements of battle in the sea actions prior to the present period, stand out in comparison. Then, an understanding of the capabilities of the main fighting strength, the ship of the line, in accordance with the general battle plan, was sufficient. The need of dove-tailing in the striking power of half a dozen different weapons so that their blows might be delivered in the proper sequence, was not a subject of study. Communication had not reached its present vital importance; nor had the bearing of an efficient service of information both air and under sea been borne home.

Modern battle is dependent upon so many elements that must be harmonized to gain complete success, that it becomes a subject for constant study and experiment. The danger is, that the daily humdrum of routine, and the ever-lasting demands of material upkeep, and individual unit training, so occupies the attention of officers in command, that the need of battle co-ordination between commands is lost sight of. One class of work is ever present, pressing at the elbow in its procession of reports and papers. The

other is less tangible and demanding in attention. It is accepted as important ; but the ever insistent details of individual operation tend to keep it, more or less, just over the horizon of accomplishment. This makes it, however, none the less vital in the ultimate day of battle.

Present sea action unrolls in rapidly moving phases in all of which the various weapons have definite tasks. Not only must the general battle plan be understood by force and individual commanders, with a thoroughly grasped force doctrine of action to meet the varying battle stages, but there must be the appreciation of what the other task groups or forces are thinking and propose to do in meeting any one of a number of particular situations.

This can only be accomplished by a system of battle training which holds those deciding hours of the future ever before the eyes, and makes their meeting a matter of paramount daily importance. All else should be secondary in interest to the commander. The preparation of the weapon is essential, but of what use is the weapon if it cannot be used in full effectiveness after it is prepared? A number of officers can assist in the preparation of the weapon, both material and personnel, under the general supervision of the head ; but there is but one officer in each unit to make the tactical decision in battle, and that is the leader. Seconds then mean much to a nation, and the responsibility is great.

TACTICAL STEPS

The ship ready to fight is a requisite step to its tactical employment. Ship handling, whatever its form, and the use of its weapons are the foundation of tactics.

The next step is the combining of the tactical efforts of a number of units of the same class. Various forces of similar type appear in tactical training.

These two steps are, in general, fairly well reached by the navies of the world. But it is the third and final step, the combining of all the forces that go to make the modern fleet in action, to which the searchlight of attention should be turned. The previous steps are of but little value, if this, the last and all important, is not thoroughly explored. In view of the rush of recent naval development, and the requirements of modern fleet action, has the service adapted itself to meet the increased demands of preparation for tactical leadership?

JUTLAND

Some points in this battle are briefly touched, to emphasize the importance of the tactical co-ordination of the fleet in action.

Service of Information.—Throughout the battle attention is called to the fact that a more successful service of information, before and during the action, would have meant much to both the British and the Germans. Neither fleet realized the proximity of the other, until a chance contact between the light forces developed. There was but little time then for any change in the general dispositions.

Weather conditions had been such that the German Zeppelins attached to the High Sea Fleet had entirely missed the Grand Fleet. This applied in part to the submarine patrols. On the other side the British, apparently, had failed to receive word of the sailing of the German fleet.

Communications.—The failure of communications at critical points during the progress of the battle, points to the need of the utmost attention to this extremely important subject. Had the British commander-in-chief more complete information of the enemy dispositions just prior to the contact between the main battleship forces, it is certain, that the British battle deployment would have been completed before the enemy was sighted by the main body.

With close gun action in a superiority of nearly two to one from a position ahead of the German advance and with the British battle cruisers and destroyers massed on the German head of column, the few remaining minutes of daylight would have been sufficient for the British. The delay that resulted from the deployment of the British battleships after sight contact gave the Germans their chance.

Tactical Co-ordination.—An excellent example of tactical co-ordination is presented by the German retirement at 6.30 p. m., from an extremely critical position. It was accomplished by a simultaneous ships right about from a bent column formation in which the head of the column was being forced around to the southward. In conjunction with this maneuver, a properly timed German destroyer attack was thrown against the Grand Fleet, and smoke screens were laid to cover the German withdrawal. The Germans only lacked the presence of fleet submarines to make the attack of the delaying screen complete.

This maneuver was successfully executed; and in illustration that it was not a matter of chance, it was repeated under almost similar conditions at about 7.20 p. m. It was full tactical appreciation and study by the German command that had prepared this maneuver for the situation that actually developed.

The night phases of the battle were examples principally of the need of reliable information and communication. The two main bodies were in proximity to each other, and yet were out of touch. It was unfortunate that the British were unable to so concentrate their light forces as to deliver a simultaneous destroyer attack on either bow of the German advance during darkness. This to be followed at daylight by renewed attacks, supported by the guns of the Grand Fleet from an intercepting position off the Horn Reef minefields.

The Germans likewise seemed to have completely lost touch with the Grand Fleet after 9 p. m. Their night destroyer attacks failed, due to their inability to find the British. Yet the two opposing main bodies were relatively close to each other. The importance of holding contact with the enemy main strength, once it is established, and of maintaining efficient communications, is seen. There was failure on both sides to mass submarines on the line of action.

At Jutland the Germans steamed into a superior British concentration. They escaped through their tactical skill.

TACTICAL PREPARATION

Leadership in battle is the distinct and privileged duty of the line officer. The demands on command to meet the tactical requirements of future fleet action are so great, that a full realization of this utterly important subject is necessary.

How then can this tactical preparation be best secured? A study of the tactical progress especially in its relation to the organization for tactical work recently employed by the principal sea powers, will furnish a certain amount of suggestion.

With this should be combined the particular requirements of our service. It is evident that the modern unit of naval command has reached a point of considerable administrative complexity. There is need of additional officer personnel with a somewhat

altered routine of daily duties. This to meet the new demands of fighting efficiency and tactical preparation.

To further the examination of the subject and to present some constructive suggestions the following phases are discussed:

TACTICAL OPPORTUNITY FOR THE LEADER

The captain of a ship should be relieved so far as possible of the minor details and routine of ship or force administration. He should be largely free from time consuming reports and paper work. Details of duty assignment, general policy and inspection are logically for his attention. With the time thus saved from small matters, he will be able to study his command from the battle preparation and tactical handling point of view. In addition, he will have the opportunity to gain the knowledge of what the capabilities are, and what action may be expected during the varying stages of battle, of all fleet types. Only so, can absolute fleet co-ordination be obtained. Not only must he know what his own command is to do to meet a given situation, but he should know of what the other fellow is thinking and what he will probably be doing five minutes hence.

There is need of a tactical aide for the leader. In the case of a captain of a ship, this aide may well be the navigator. The navigator's duties should be adjusted accordingly. A War College course, and tactical instruction, should be part of the requirements of both of these officers before assuming their duties afloat.

The executive of a ship might well take over many of the details of administration and routine, which now occupy the captain's attention; and in turn, an executive aide, an officer of rank and experience should be assigned to each first rate ship to assist the executive in covering the increased field of his activities. The first lieutenant to continue his duties as at present. The modern battleship has reached a point in development, where sufficient officers should be provided, if there is to be an adequate planning and efficient tactical preparation at the head.

For a commander of a division of ships it would be well to have an officer of experience detailed as tactical aide; and in the case of a squadron commander, this officer should be of captain's rank. On the staff of the commander-in-chief, the tactical aide should be an officer of flag rank, and should be in addition to the chief of staff.

Besides the above, all fleet and force staffs should have representatives of the various fleet types as liaison officers. These officers to be connecting links with the particular element of the fleet which they represent. An appreciation of type capability would be one result of their presence on the staff. They could aid materially in war games, and in tactical war preparation, and in the dissemination of general information. Thus a destroyer aide, a submarine aide and an aircraft aide would be found on the staff of the commander-in-chief.

The Germans early realized the importance of adequate officer assignment to ships, and of installing a system whereby there was a natural flow of tactical information. The demands of the future will be much greater in this respect than has been the case in the past.

The Game Board.—Wherever possible, tactical game boards to be installed afloat and used for study and test purposes. All sea tactical maneuvers can be played to advantage at the game board, as a preliminary to the actual getting underway. The maneuvering of the fleet with all its component parts present, is necessary for a proper appreciation of the effect on time and space of battle speed. But the game board can prepare the way, and the sea maneuvers when executed will be more progressive as a result of its work. It would be well, if the new ships in building had installed a tactical game room compartment with its necessary equipment.

Tactical Study.—The establishment of a Junior War College course, as has been proposed, would aid materially in tactical preparation. This combined with the War College extension course and an expansion of the present War College to meet the requirements of all present flag and command officers would do much during the next few years in preparing the fleet and in holding it tactically ready for battle. And unless a fleet is tactically abreast or ahead of the times it is but a poor investment.

The whole subject of tactics is one that of necessity is in a state of flux. The force doctrine of attack of to-day, changes with new developments. Therein is the need for constant study, and for a tactical fleet organization that will readily disseminate and keep up to date all tactical information.

As examples for study the following are mentioned:

(1) Battle signals and communications of all types.

(2) Co-ordination in battle effort of the different fleet forces for the successive phases of action, day and night.

(3) Use of smoke screens with all classes of ships, and the employment of indirect fire control.

(4) Tactical scouting with the employment in combination of aircraft, and submarine.

It is in the fleet that progress must be made. Courses of instruction, as at the War College, prepare the mind and point the way. Full progress can only be made in the fleet where all the elements are present for sea test.

It is time that we as a service raise our eyes from the deck to the horizon, and the importance of tactical preparation.

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THE QUALIFICATIONS FOR LEADERSHIP

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In the great crises of ancient and modern history, at times when nations have fallen, the geographical outlines of countries changed, affairs of states become revolutionized, and the trend of the masses has brought about some startling transition, there has always loomed up a great figure, one who has risen head and shoulders above his contemporaries, a leader who by military skill or the genius of professional sagacity has "hitched his wagon to a star"; around whom the hopes and the ideals of the multitudes have clustered.

Alexander led his people to the attainment of mastery over half of Europe and Asia Minor; Hannibal established the principles of Carthage in the courts of his numerous conquered vassals and built up a great empire rivalling that of Rome; Cæsar, the acknowledged sponsor of Roman culture and military success, raised up the mightiest of ancient governments to a pinnacle from which only the loss of his own stimulus in governmental affairs caused its downfall. In more modern times we find the first bickerings of the great Prussian kingdom centering around the prominent figure of Frederick the Great. Following him a half century is the man who dragged France from the chaos of social anarchy, riot and bloodshed to that of the first power of the European continent. Bonaparte, by the sheer force of his example of leadership, clutched France from the depths of despair, organized her masses, set a definite goal, led her to triumph, and then by fallacies in his own character lost a great part of what he had gained. Yet the lasting example of leadership he had given when he was at his best became so inculcated into the life of the people that France never forgot. It is upon the structure of those principles laid

down by Napoleon, the man, that the modern French republic is constructed. There are more examples, too numerous to exploit in a brief treatise of this kind, how the force of leadership of a single man has altered the destinies of peoples and wrought changes in the political fabric of nations. No better record can be found of the tremendous power and influence of leadership than in a study of past history, and frequent references will be made to the lives of the great fore-runners whose characters individually and collectively afford the most concrete examples of successful leadership.

Jomini, Marshal Ney's chief of staff, states: "The most essential qualities for an army leader will always be; a great character or constitutional courage which impels to great resolves, then sang froid which impels to bodily courage which conquers danger, knowledge appears only in third line but it will be a strong help, one must be blind not to admit it." What Jomini says of an army leader is equally applicable to leaders in all branches of civil and military life except it is not agreed that knowledge should be placed in a subordinate position to the others.

The two great qualifications for the leadership of men are those of intellect and character and the proper balance between the two may be stated as a third. That knowledge is of main importance is definitely proved in a study of the careers of past leaders. For instance we know little of Cæsar's youth and ambition to learn, but we do know, as Lieutenant Colonel Dodge, U. S. A., states in his works, that no man in his legion worked harder than Cæsar himself. He did not labor diligently until he had acquired a thorough understanding of military strategy and tactics and then rest on his laurels, nor did he cease when a full knowledge of governmental affairs was encompassed within his mind. Cæsar strove continuously, studiously, conscientiously in the interests of Rome, her government and her people. It was the ambition, the desire to learn more and to rise one step higher; and never tiring, never allowing himself to be satisfied with one or two great victories or achievements; Cæsar led until the moment of his betrayal and death.

Napoleon, in his student days at Brienne, was noted for his intense application to his studies. We find a statement in John C. Ropes' "First Napoleon" of the great French leader's premier virtues as being, "his untiring industry, his devotion to the pub-

lic service" and that "he studied continuously." Furthermore we read that he wrote commentaries for his own use on the campaigns of Cæsar in Gaul and the strategy of Frederick in Silesia and Saxony. These are statements about a man with definite ambitions and the will to accomplish through the acquisition of knowledge. Realizing the great field for operations in a military profession, the multitude of opportunities offered a skillful strategist and tactician, he never failed to perfect himself when the opportunity was available, by study and personal contact with situations which would teach more. We see him at Toulon as a major of artillery handle a situation too complex for commanding generals on the scene and from there through a program of commands to the leadership of the Army of Italy. Never relaxing, one step led to another until France was at his feet and then Europe. He failed finally in that his personal ambitions ever pursuing his better qualities finally overtook him and swamped him in a myriad of costly blunders which resulted in his downfall. The lesson to be taken from his career is not in his ultimate failure, for that was purely personal, but in the fact that, like Cæsar, he worked, he studied, he was relentless in a study of the details of his profession and in ever accomplishing more.

As types of brilliant leadership these two characters of two separate eras demonstrate the first and foremost truth that knowledge is essential in the human fabric of the successful leader. Thumbing over the pages of history there is not a single illustration of the true spirit of leadership as recognized by the mass's acknowledgment of such superiority and the striking results attended by such which was not based upon this fundamental principle of ambition to perfect and improve by application to study and the setting of a plane one step higher than seems possible to attain.

The man in command must endeavor to comprehend as much about the duties of his subordinates as do those subordinates themselves in order that he may intelligently issue orders and instruction to them. This may seem a broad statement to make, but it is merely a principle, and should not be applied necessarily to extreme cases. Picture the coxswain of a lifeboat who knows neither the theory nor the practice of lowering a boat in a heavy sea issuing orders to twelve men in the emergency of "man overboard" at sea. Imagine the water-tender, who has never experi-

enced a casualty on a boiler, who has never read nor studied safety instructions, and who understands nothing about a boiler except what he has been forced to learn in daily routine work, giving commands to his men when a tube bursts. Then too the gun captain who has learned nothing more than is required of him in the daily opening and closing of the breech mechanism—fancy the clearness and commanding force of his orders to the gun crew when a powder bag breaks and powder is thrown around the turret chamber.

These are but practical illustrations of the fact that to become a leader a man must know not only what he individually is required to do in all cases. The principle stated assumes tremendous proportions when we contemplate the gigantic task thus demanded of the admiral of the fleet or the commanding general of the army or the president of the shipbuilding corporation. It must be remembered, however, that these positions are obtained only by years of constant work and demonstration of capability. Knowledge is one of the first main factors in attaining that success of ultimate command of the whole, and though it is not possible to absorb all of the knowledge which this great world offers, nor which any particular phase of it offers, yet it is the percentage of perfection, the multiple obtained in the relations of knowledge obtained to that capable of being obtained upon which is based the degree of success and the rise to power of a leader. To be a perfect leader is then as impossible as to be a perfect man but to aim to be a perfect leader in the practice of the fundamentals and from this fact to first of all aim to acquire all of the professional knowledge possible in the short time allotted to us on earth is axiomatic. Leadership involves power—power over masses and over things. Knowledge is power and by mathematical substitution knowledge is leadership.

The second main factor in an analysis of the subject of leadership, that of character, embodies many of the features comprising the element of knowledge and the two are very closely related, especially in the consideration of ambition which is the basis of character and a necessity for the acquisition of knowledge. Rear Admiral Stirling has declared with keen insight into the problem that "for a military leader qualities of character that have the greatest weight are decision and good sense." Speaking of the qualifications for officers Major-General Shanks, National Army,

reiterates the same idea, "Of all essential qualities common sense is easily first and foremost." This is a large subject, common sense, and embraces very nearly the entire subject of character to say nothing of knowledge and intellect.

Laws and regulations are nothing but pure common sense. Cain slew Abel and realizing that murder would eventually exterminate the human race it became a commandment, "Thou shalt do no murder." Vessels propelled by steam or other machinery are handled with greater facility than those propelled by sail power. Hence it has become a law for the former to keep clear of the latter. To exercise common sense in the execution of his duties a leader must conscientiously and thoroughly analyze any question which comes to him for solution and he must arrive at a conclusion founded upon acknowledged practice and truths, the justice of which cannot be questioned. The man in command cannot be so overwhelmed with his own importance nor officious to the extent that he is unable to pronounce common sense judgment in matters of seemingly trivial importance. Think of the young army officer who would not form his company in single file marching through a narrow ravine because the drill book specified the column of squads as the natural marching order. History tells us that Braddock refused to take Washington's advice to deploy his men and fight as the savages fought because English regiments had never battled that way before. Not so very long ago an officer on a vessel undergoing full power trials failed to take the necessary precautions to prevent the explosion of her boilers because a superior officer not on the scene of action had ordered him to hold out a little longer with the resultant loss of some fifteen or twenty lives. Though the above are examples as much of the lack of appreciation of the value of initiative yet they are flagrant illustrations of violations of established rules of common sense as well as self-preservation, the first law of nature.

Common sense is nothing other than the basis for all good traits of character. There is a correct method and an incorrect method and variations of both for the attainment of the qualities of successful leadership, and the shortest course is founded entirely upon the aforesaid principles of common sense.

There is secondly the element of character known as personality. Why do some men impress their ideas and their beings

on a group of men more forcibly than others? Why does one manager and one gang leader produce greater results with the same number of men than another? Why can one officer take a division of men on board ship and achieve what seemed impossible for another officer with the same men? These questions may all be answered in the simple statement of force of personality. Personality is very often the product of heredity and more often that of environment though neither of these should be a restriction to a man. The great number of self-made men in the world without the advantages of either and often with many of the disadvantages of both are sufficient proof of the above declaration. Personality requires the ability to think clearly, talk forcibly, act quickly and the maintenance of a well-groomed personal appearance. The man with habits of neatness and cleanliness in dress is the one who attracts attention in a crowd. Give him a chance to speak and if he rises to the occasion, talks with force and emphasis in a clear manner the impression he will create will be of such a nature as to place him as the acknowledged leader of that crowd immediately. Place the same man before another group to which he has been arbitrarily assigned as leader and unless he possesses the above qualities to some degree, unless he presents the personal appearance of one logical to command, his leadership will be founded purely upon the thin threads of forced discipline. Thus it is in the military services with the commissioned, non-commissioned, or petty officer who without personality commands by virtue of his rank only, a meager something which requires the backing of an entire code of laws to be of any value—surely an artificial leadership.

Some people attribute little importance to the ability of speaking clearly if they can think clearly but what good are thoughts encompassed within the mind of the individual, thoughts which should be disseminated and put to practical use. The iron ore is of little value below the surface of the earth, but how different when it expresses itself in the form of locomotives, buildings and bridges. Of course those who express their ideas with the pen or the brush are leaders in one sense, leaders in the field of art. Leadership requires the clear expression of ideas in such a manner as to enlist support and co-operation. This may be accomplished either by writing or talking and, whereas writing carries little of the force of personality, except the tabulated opinions of the

author without the stimulus of his actual appearance to further emphasize his ideas, it follows that speaking is the logical medium or at least the one more productive or results in the distribution of the magnetism of human leadership.

In our great law-making Congress where debate and free speech are the most fundamental of rights we find the political, economic, and diplomatic leaders of the nation public speakers. The attainment of their positions of importance, necessitated appearing before their constituents and expressing in as convincing manner as possible the principles of government which they and their party represented, else how could they have hoped for success? They certainly could never have counted on election by a campaign managed entirely from the editorial pages of a newspaper or magazine; for the people of this nation and any nation in fact demand to see and to hear the men who are going to manage the affairs of state, to judge for themselves the special qualifications of those who aspire to leadership and no volume of argument on paper, no statement of a party platform by the national committee will take the place of that appearance and speaking in public before a crowd which the people have always demanded. We shall never live to see the day in this country when the stuttering, stammering blockhead who can pen a beautiful essay or a convincing argument or a brilliant editorial will be voted to the eminent positions of leadership in the affairs of government.

The ability to act quickly is one best acquired by experience and preparation. A leader is tested in an emergency, whether it be on board a sinking vessel, in a burning house, or at a state discussion where affairs of nations hang on the words and letters of a few assembled statesmen. Not all are blessed with that combination of good and bad fortune which allows us to be placed in positions requiring quick action or to witness emergencies from which we escape unscathed. Consequently it is essential to have one's mind prepared to act with judgment, common sense, coolness, and rapidity in all emergencies whether of a minor or major character. What would you do at sea in an open boat, a compass, a set of spars and a boat full of frightened women and children to make the best of your way to land? What would you attempt in a crowded theater if fire broke out? Suppose yourself in charge of a water tube boiler when a tube bursts; what course of action would you pursue? A man's clearness of conception of

his duty, the quickness and coolness of his action in each of the above cases as in thousands of others are what test his mettle as a leader. "All's well that ends well" is a very appropriate phrase but things can only end well when the unforeseen is prepared for ahead of time. A ship at sea is supposed to steam or sail gracefully over the waters but what if she strikes an uncharted rock or by inaccurate navigation piles up on a wave-swept beach? The situation immediately changes from the common everyday occurrence of a vessel at sea into an emergency requiring careful leadership based upon a preparation for just such an emergency beforehand. The responsibility naturally falls upon the captain; and to be the leader that his post designates him, he must act calmly and quickly or all is lost in a panic of human beings seeking safety. One false move on the part of the leader and either another must rise to take his place or there will be a mad rush and scramble for boats and life rafts with the attendant disastrous results.

Two of the greatest figures in history who possessed this valuable personal asset of acting quickly on occasions demanding it are those of Napoleon and in our own national life "Stonewall" Jackson. In practically all of his engagements the French emperor was confronted by forces greater than and many times double his own. To strike at the right spot with overwhelming numbers and an inferior total force was ever his problem; to suddenly cease action in one locality to concentrate in another his task. When reports of operations of his troops and those of the enemy came to headquarters fancy the rapidity with which his mind must have functioned to have grasped the entire strategic situation; picture him standing before his staff of officers issuing orders for action clearly and definitely with a force and precision which few great leaders have equalled and none have surpassed. To accomplish the end of victory he could neither vacillate nor wait for further information to weigh his intentions in the balance. Immediate action was always required. We can only conjecture the rapidity with which Jackson's mind must have operated, the promptness, the clearness and accuracy with which orders must have been issued and executed to have achieved the glorious results of Chancellorsville where with sixty thousand men he forced defeat upon a combination rated at from one hundred and ten to one hundred and thirty thousand. Both cases are splendid illustrations of the results which the qualifications of

clearness of thought and rapidity of action may attain for a leader so endowed.

That the element of the personal touch enters largely into the makeup of a man's and a leader's character is demonstrated in every daily meeting in every branch of life. By personal touch is meant that keen sensibility coupled with the due exercise of common-sense which inquires into and understands the feelings and points of view of fellowmen, that personal magnetism which attracts others to confide their difficulties and problems, that ability which sees into the depths of the soul and comprehends. This is a tremendous virtue and involves those intrinsically important features which make an individual stand out in the capacity of leadership ; those of kindness and impartiality, cheerfulness and firmness, justice and promptness.

Then there is that word in the English language about which the experiences of the recent war have prompted so many criticisms and opinions. It is called discipline and the reason is two fold. First of all many men were jumped to the positions of leadership who were not fit leaders in the true sense of the word and whose only guide was a set of regulations laid down by a War or Navy Department ; secondly, the greater part of the host of American youths was snatched from lives of comparative freedom and independence to one of subjection to iron-bound rules of action and codes of laws seemingly unnecessary and at times rather harshly executed. It was the sudden transition in both cases from the civil to the military, neither of which thoroughly understands the other, that wrought the many difficulties and misunderstandings.

Leaders cannot be made over night ; a man cannot be given a commission, a uniform and a set of regulations and then expect that he will be the acknowledged leader of his command by virtue of these gifts alone. He may apply the cast iron rules to every situation which arises ; he may answer every question by reference to his little blue book ; he may catechise as from the bible itself but he will lack that quality known as radiance of personality, that personal touch which characterizes the real leader from the empty uniform.

The secret of success in the attainment of this so-called personal touch, this close intimacy with fellow-beings lies in adaptability ; that is, the ability to place one's self on the same plane with

a subordinate and by force of example to demonstrate the qualifications for leadership. The foreman who can handle a pick and shovel and will use them to demonstrate the correct method of digging a ditch has placed himself on a level with his men and has shown them practically that his ability to command them is based upon a full knowledge of their task and not upon some flimsy structure of social position or "stand-in" with the boss. The lieutenant who can and who before a company of his men does handle a rifle with dexterity and accuracy has perhaps sacrificed for a moment the more dignified appearance of wielding a saber but has demonstrated the fact that silk gloves and a polished scabbard are not alone symbols of his ability to lead them. The young ensign who can and does splice a rope for the instruction of his men ; who can and does use a shovel or slice bar to demonstrate the proper method of firing a boiler ; who dives down and blackens his face and hands with the toil and sweat of honest labor is the man who will be naturally and unqualifiedly hailed as the leader of his men. He has not faltered in getting down to rock bottom, in adapting himself to the conditions of those who work under him, in understanding their hardships and comprehending their points of view. He cannot fail to have that personal touch with his subordinates which characterizes the true spirit of leadership.

It must not be assumed from the above statements that a man must get out and shovel dirt to create the impression of practical ability. It is merely that spirit of willingness to do so if necessary, that desire to understand those men whose daily task it is to build or tear down and to lead them in security and contentment to the accomplishment of some objective.

This concludes the discussion of the many elements which combined create personality, one factor essential to successful leadership. It is this spirit of co-operation, of mutual concession between employer and employed, officer and man, leader and follower which will ultimately achieve the results that an organization may hope to attain. Lincoln commenced his career in a log cabin in Kentucky, later split rails in Illinois, and still later succeeded to the leadership of the great body of American people of all states. Lincoln never failed to understand and appreciate the laboring man of the nation ; he had been one himself and could readily comprehend their status in the society of mankind and

their outlook on life. Washington had from experience become thoroughly versant with the habits and customs of the pioneers, the savages, the backwoodsmen, and the more organized class of colonists. America has never had a more comprehending leader of her heterogeneous masses than her first president. He had never feared to labor with his hands as an aspirant to success and when the first office of the land crowned his final efforts who can doubt but that Washington if challenged would have stooped to fell an oak, wrap and tie a bale of tobacco, or handle a flintlock. The spirit of co-operation between the people and their acknowledged leader in these two cases manifested itself finally in the accomplishment of that for which they both strove. Inbued with the ardor in the one case of establishing the Union and in the other of preserving it, the American people finally attained success through and with the acknowledged leadership of those two great characters, who led not alone by the rigid wording of the Constitution but by the principles of justice and common sense, by the exercise of that co-ordination which will always elevate to greater things and produce results of a higher order in a combination of human beings led by such personalities.

Cheerfulness is an easy thing to talk about and to think about, but its doctrines are very difficult to practice continuously in the face of pain, sorrow, adversity, failure. It may be stated as a general axiom that the cheerfulness of a man varies inversely as the number of persons with whom he comes in contact. Likewise the problem of cheerful leadership becomes more involved as the number of different individuals over which responsibility is assumed increases, and the successful leader must adjust his disposition to deal with the thousand and one complex characters in an equally fair-minded manner. Each man in a group will have his individual problem in life to solve, his own outlook on things, his own particular environment, to say nothing of the very important traits of heredity. It is to understand and deal justly without show of impatience in each case that the leader must cultivate a cheerful demeanor.

Cheerfulness bespeaks a positive nature and is a virtue of the highest order. The man who can display a sunny disposition in the face of all the problems which fate unfolds before him, whether they be simple or complex, has conquered the human failing so often evident in weak characters, that of a surrender of hopes

and ambitions in the face of combinations of trying circumstances. Take for instance the case of the commanding officer of a company, regiment or division of men and suppose that some half dozen or more desert, rob, or perjure in spite of the earnest efforts of the leader to improve the conditions of his command, in spite of trust and faith placed in them. Is it a righteous principle or doctrine which abandons all trust, assumes the whole to be of the same caliber as the minority, and which refuses future consideration and interest? This is a common occurrence in a small organization with leadership which cannot see beyond the confines of petty suspicion at the finer and broader responsibilities of command. It is the easiest course to strike at the minority by punishing the majority when exasperated beyond the limit of self-control but it is not the fairest nor the most productive of results. Where there is such surrender of patience there can never be common understanding and sympathy between leader and subordinates necessary in a perfect organization. Washington could never have suspected the sincerity of his generals in the face of Arnold's treason or he would surely have courted disaster. The positive side of one's character must never succumb to the few negatives which are often cast in the way, otherwise leadership must inevitably fall to a state of petty subordination. The faith, the cheerfulness—for the two are analogous—of the Christ towards his people despite the trials and tribulations, faithlessness, slander, and torture preceding Calvary is the foundation of the Christianity which permeates the national life of every great country to-day. That cheerfulness, that positiveness of nature is the symbol of the Divine Leadership which led to a greater and better civilization.

Major-General Shanks has aptly stated that "Of all the valuable qualities which an officer can have, few of them are superior in importance to tact." Tact involves a first rate knowledge of human nature and is an essential in all classes of leadership. The ability to understand all phases of life as applied to individual cases, to act and speak accordingly with due appreciation of all the features involved is the sum and substance of tact. Tactfulness towards superiors and towards subordinates is the mark of a gentleman and a requisite of leadership. Nothing distinguished Washington in his dealings with men so much as his ready power of perceiving points of view and his gentlemanly ac-

tion in dealing with all circumstances. We find evidence of this fact in his letters to his generals and the statesmen, in his memoirs, and in his differences with members of the political cabal formed against him.

In concluding the subject of personality special stress should be laid on the subject of ambition—definite, legitimate ambition. The man at the head of an organization or group of men who has a clear conception of his goal, of his ultimate object, and who imparts this purpose to the entire body under him, creating a motive for employment based not alone on the contents of the weekly pay envelope, cannot fail to achieve success and take his men with him. "In union there is strength," says the proverb and in the united ambition of a collective assembly there is that "will to do" which spells accomplishment. The supremacy of France was the ambition of the greatest of French generals and it was the ambition of every troop in every army corps. No matter what the duty or what the goal may be, the aim of the leader must be imparted to every soul involved, it must be the slogan on every pair of lips and the light in every pair of eyes to carry the case to the extreme. Whether it be the record-building construction of a vessel on the ways or the winning of the regimental colors the ambition of the manager should be that of every riveter and mechanic; the ambition of the colonel that of every sergeant, corporal and private.

Ambition carries with it, independent of other virtues, a great lesson to a body of people in the way of examples. The leader who exhibits practically, to a group of men that he commands, his ambition to learn more and more about the phases of their labor, who goes into shop and foundry, office and factory, to learn the rudiments of the trades he supervises; who by application to his studies reaches that point where he can ably instruct; who can assimilate all of his knowledge in the practical intelligent command of every little detail; and then who on top of that can state or by action exemplify the fact that he wishes to learn still more and is really only at the bottom of the ladder of knowledge—that man cannot fail to be an inspiration of the highest order to those who come under his sphere of influence.

The subject of loyalty is a very broad one and yet in its every sense it is essential to good character. It embodies all of that far-seeing ambition and faith displayed in a strong personality.

Loyalty to one's God, one's country, and one's family are what we all expect but the loyalty to personal authority which is so often necessary in the military services as well as in the business and technical professions of civil life is oft times difficult. Personalities so many times enter into the line of duty demanded in the army and navy or in fact any organization that the main object in view to demand one's loyalty is often lost sight of. How often do we find a soldier or a sailor refusing to keep clean and tidy and offering a general appearance of neglect to spite a superior officer for whom he has a personal dislike. The mistaken idea involved is that his loyalty is based entirely upon a conception of the personality rather than the ideals or the interests of the organization which he serves. The man harms himself alone. By reason of his momentary slackness and disinterestedness he places himself on the level of those unfit to command because of this subordination of the ideal to the material, principle to personality, loyalty to the bigger and better things to those of self. He who follows the false colors of personalities will forever remain a subordinate. Commander Schofield, U. S. N., has stated, "Loyalty means the continued consciousness of membership, of partnership in the whole. It means that the desire for the good of the whole must predominate." The following is what the army demands of commanding officers reporting upon the fitness of subordinate officers: "Proper authority having decided on the methods and procedure to accomplish a certain desirable end, state whether he impresses you as being an officer who will co-operate energetically and loyally in accomplishing this end *regardless of his personal views in the matter.*"

What greater examples of unfailing loyalty and fidelity to a cause than that of our own Washington, the first to rise above colonial prejudices and become national; Bismarck who looked beyond the personalities of the Hohenzollerns at the formation of a great German Empire; and the extreme case of unflinching devotion to duty displayed at Balaclava in the Crimean War? They are all instances of loyalty to a principle or to a cause, an abandonment of the petty prejudices of personalities which tend to tear down the framework of character.

Following upon a consideration of loyalty and in conjunction therewith is that of subordination. It has been said that a poor subordinate will never make a successful leader. Napoleon in

some of his letters disagreed with this theory and from the course of his life we might deduce the fact that this very lack of appreciation of the qualities of subordination eventually caused his failure. He seemed to underestimate even the superiority of the elements and of nature, for after such overwhelming victories as those of Jena and Austerlitz, it seems that Bonaparte failed to concede the impossibility of any task. Therein lay his lack of appreciation of the qualities of subordination.

It would be rather harsh to accuse him of attempting to rival the Gods, but it is fair to say that he certainly never realized the superiority of any combination of earthly circumstances with which he must concede an impossibility to cope.

Furthermore, it is reasonable to state that a man who as a junior cannot subordinate his own views to the opinions of higher authority and devote himself loyally to a cause can never demand such action on the part of his inferiors in rank and experience should he be placed in a position of command. Leadership would surely be an hypocrisy which allows the commanding personage the exactions of discipline and obedience, the practice of which he never himself exercised.

The majority of the premier qualities which constitute the character of the leader have been stated but there are yet two others which are outstanding features of the will and privilege to command. The exercise of initiative and the wilful assumption of responsibility are characteristics which distinguish probably more than any other between the leader and the follower, between the broad man and the narrow-minded victim of environment, between the success of accomplishment and the casual indifference of mere humdrum existence.

The emergencies which occur at different moments in one's career are usually direct tests of a man's initiative. Admiral Stirling calls it "trained initiative" and he means the preparation and moulding of one's point of view in younger years to assume the personal control of unforeseen situations and to take full responsibility for the results of any action taken—the trained mind to take command in emergencies.

Bismarck had decided ideas on this subject, for in his memoirs, speaking of the particular type of diplomatist then dominant in Prussian affairs of state, he says, "Another feature was the disinclination to accept personal responsibility when not covered by

unmistakable instructions just as was the case in the military service in 1806, in the old school of the Frederickian period."

What was the outstanding feature of the success of Farragut at Mobile Bay and of Dewey at Manila except that both officers exercised the extreme of initiative in forcing a hazardous entrance to a well fortified harbor in the face of the most difficult circumstances with but few instructions to guide them, and furthermore that they willingly assumed full responsibility for all consequences? The measure of their successes as well as their striking examples of superior leadership and the interpretation of its principles are what place them foremost in the annals of Aemircan naval history.

English naval history affords many similar illustrations. Mahan points out in several of his works how the rigid wording of the Fighting Instructions of the 18th century had very nearly gagged and bound the flag and commanding officers from the exercise of any discretion or initiative in tactical formation, or at least they had thoroughly restricted the activities of those officers of higher rank who might by weakness of character or constrained point of view be addicted to extreme short-sightedness in obeying the letter rather than the spirit of the law. Matthews at Toulon in 1744 and Byng at Minorca in 1756 presented the most flagrant cases of disaster, resulting in the dismissal of the former and the execution of the latter. Following the tactical instructions word for word in two situations never before encountered and hence never allowed for in the phraseology of the rules, they both brought the sting of defeat to two of His Majesty's squadrons. England also furnishes two of the greatest examples of the willingness to accept personal responsibility and to initiate action in the figures of Nelson and Rodney. Nelson at the Nile, Nelson at Copenhagen, and Nelson at Trafalgar under three entirely different conditions demonstrates the special significance of initiative in the makeup of the leader. Likewise Rodney on the West Indian station without instructions from the Admiralty and in the face of an approaching French squadron abandoned the protection of the Windward Islands in the more important task of preventing the enemy acquisition of Jamaica.

"Stonewall" Jackson is spoken of in the most glowing terms on this same subject, "He accepted responsibility with the same equanimity that he faced the bullets of the enemy."

How often is heard the expression, "Well, that's not my job." It's the fireman's job to put out the fire destroying a building but that doesn't prevent the man in the office from throwing a bucket of water on the blazing curtain which started the fire. It's the life-guard's job to rescue the drowning person but that doesn't relieve the big athletic fellow on the dock close by from rendering all possible assistance. A refusal to accept responsibility in one case may result in the dwarfing of one's point of view such that when the opportunity comes to meet a situation or to rise the man may not be equal to it. The belief in the restriction to one's own special branch of work with neither knowledge nor interest in any other will result in the sequel of forever narrowing a man to that one line of operations, and he will never be able to rise above that level on which he has placed himself. The mere pipefitter can never be the head of a plumbing concern; the special lathe mechanic who can run but one type of lathe will never be a shop foreman or plant manager; the fireman who is content with shovelling coal out of a bunker will never be an engineer; the seaman or deckhand who is satisfied with slapping paint on a ship's side will never have a command of his own. There should always be that constant desire and exertion to learn more; more about one's own particular line of work and more about the duties and responsibilities of the people above so that when the opportunity arrives there will be no hesitancy, no doubt as to qualifications for advancement. The keynote may be found in that one word—initiative—expressed as a two-fold proposition: "(1) the power to make starts, and (2) to act upon one's own responsibility in order to help the cause of the chief." The latter, a quotation, might better read "in order to help the chief cause."

The last is a consideration of moral qualities of the highest order as a basic element of character. The true leader must be a personification of the maxim "Do as I do" rather than the distortion of "Do as I say do." The force of example is the most impressive means by which the loyalty and obedience of a group of followers may be obtained. Disciplining a man for drunkenness the morning after one's own night out, or in the face of recent carousals known to that subordinate can have but little effect in changing him for the better. The foreman can censure under cover of the company's or firm's rules, the mili-

tary officer may punish by virtue of the regulations, but neither of them has accomplished anything nor demonstrated his own superior qualities of leadership by force of his personal example.

An examination of history will reveal the truth of these statements. Practically every great leader of the military, political or social activities of the past has acquired such leadership as much by the force of example as by any other means. Cleanness of morals may have been forsaken after rise to power, resulting thereby in the downfall of the leadership, but the original success was gained only by the force of example of character and integrity.

Here is concluded a detailed discussion of the factors which constitute the qualifications for successful leadership and before leaving the subject with a few concluding remarks a general summary of the points taken up to stress the two main requisites of knowledge and character would be in order. Knowledge requires an understanding of principles of one's profession and a never-ceasing endeavor to acquire further information of particular advantage to the line of work assumed; a knowledge of all things that will benefit an aspirant to success and the leadership of men. Character demands first of all good, wholesome, everyday common sense which in itself spells personality. The latter includes the elements of clearness of thought, quickness of action, sound judgment, cheerfulness, tact, forcefulness of speech and appearance, neatness, self-evident ambition, faith in humanity, keen insight into human affairs, the appreciation of individual points of view, and adaptability. Lastly, there are the prime requisites of loyalty, the will to initiate and assume responsibility, the necessary quality of subordination to ideals rather than personalities, and the belief in and practice of the force of example.

Suffice it to say that the average human being cannot possess all of these but, as has been pointed out before, the measure of one's worth lies in the percentage of accomplishment. The eternal goal of perfection is set so out of human reach that it may seem well nigh impossible of attainment, but it is the calculation of the effort which judges men, the ratio of results obtained to those capable of being obtained. Leadership is success for it involves the only two elements upon which all of the other complexities of life are based.

In summarizing the characteristics of that great leader of a new-born Commonwealth who illustrated so clearly and convincingly what the observance of the natural rules for pursuing a successful career of leadership may produce, Henry Cabot Lodge has stated in one paragraph the principles elucidated above. He says, "I see in Washington a great soldier who fought a trying war to a successful end impossible without him; a great statesman who did more than all other men to lay the foundations of a republic which has endured in prosperity for more than a century. I find in him a marvellous judgment which was never at fault, a penetrating vision which beheld the future of America when it was dim to other eyes, a great intellectual force, a will of iron, an unyielding grasp of facts and an unequalled strength of patriotic purpose. I see in him too a pure and high minded gentleman of dauntless courage and stainless honor, simple and stately manner, kind and generous of heart." A great tribute to the greatest of American leaders, and a fitting model to take as the exponent of successful leadership.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LOYALTY¹

By REAR ADMIRAL R. H. JACKSON, U. S. Navy

The theme which I have chosen for my address is *loyalty*. I will define loyalty and show you that it is the foundation of all the virtues and that in some form it is of constant application throughout our career. That here to-day I am employing it in my address to you—a loyalty to this institution.

Loyalty is ordinarily defined as fidelity to superior, to duty, etc. A synonym of fidelity which is in turn derived from *fides*, faith.

But loyalty connotes feeling or sentiment, strong or enthusiastic, accompanying a sense of allegiance. It begets action; it is faith with works.

Royce tells us:

Loyalty is indeed an old word and a precious one and the general idea of loyalty is still far older than the word, and immeasurably more precious. For everybody has heard of loyalty; most prize it; but few perceive in its inmost spirit what it really is—the heart of all the virtues, the central duty among all the duties.

In loyalty is the fulfillment of the whole moral law.

Justice, charity, wisdom, **spirituality**, are all defined in the terms of enlightened loyalty. For **loyalty** is the willing and practical and thorough-going devotion of a person to a cause.

Nor is loyalty mere emotion. Adoration and affection may go with loyalty; but they can never alone constitute loyalty.

Furthermore the devotion of the loyal man involves a sort of restraint or submission of his natural desire to the cause.

Loyalty without self-control is impossible.

The loyal man serves. That is he does not merely follow his own impulses.

¹ An address delivered at the graduation of the Naval War College, class of December, 1919. Naval War College, Newport, R. I., November 20, 1920.

He looks to his cause for his guidance. This cause tells him what to do and how to do it.

His devotion furthermore is entire. His is ready to live or to die as the cause directs.

In this cause is your life, your will, your opportunity, your fulfillment.

Furthermore, loyalty is contagious. It affects not only you, the fellow-servant of your own special cause, but also those who know of this act.

Loyalty is a good that spreads. Live it and you thereby cultivate it in other men.

Now you may say this is a fine philosophy; but where is the application to the service? I would not be a true exponent of the applicatory system if I did not endeavor to point out that loyalty is to be practiced daily.

At this moment I am applying it to this institution, the War College.

The previous valedictorians have shown their loyalty to the college in their addresses.

One gave a sketch of the college, its growth, its excellent work and its benefit to the service and went forth as a missionary urging that more officers be sent to profit by its course.

Another partly in his own words, and partly in those of Kipling in prose and in poetry testified to the benefits that he and all of his class has received, and commended the soundness of the doctrine.

To the testimony of these witnesses the graduation class echoes a loud *aye, aye*; most heartily responds *aye, aye*.

The college doctrine brings out the need for loyalty to the leader, and loyalty to the plan.

My theme is to emphasize the need of an all-embracing loyalty to the service and the flag—a loyalty to loyalty.

Now this does not always exist.

We know officers who are not loyal to the Naval Academy, their foster-mother. Yet that institution made them in part what they are. They thus become disloyal to themselves.

On board ship the officers and crew are generally most loyal to the ship and to the captain. Woe betide the ship if this be not so. If they be not loyal, they themselves are to blame, and their character is adversely affected by this lack of loyalty.

But in how many ships do we find any loyalty to the division or to the fleet as a whole?

The most successful division commander that I have ever known had on the after turret of the flagship the words "For the Fleet." Every officer and every man in that division was better for that motto.

Let us turn to the "Articles for the Government of the United States Navy" which is our military guide, we might say our Bible, and see what position loyalty holds.

The commanders of all fleets, squadrons and vessels belonging to the navy shall show in themselves a good example of VIRTUE, HONOR, PATRIOTISM and SUBORDINATION.

Now *patriotism* is *loyalty* to the country.

Subordination is *loyalty* to authority, to the commander and to his plan. Insubordination is disloyalty.

Virtue, which here means valor or courage, implies a willingness to fight for one's beliefs and principles. Timidity or cowardice implies a willingness to abandon them, a disloyalty to them.

Honor is a nice sense of what is *just, right and true*.

Honor is really loyalty to self.

Thus we see that the first two principles *virtue* and *honor* are founded on *loyalty* and the latter two *patriotism* and *subordination* are really forms of loyalty itself.

So that our navy Bible may be said to be founded on these three, *virtue, honor and loyalty*, but the greatest of these is loyalty.

It is interesting to find that in the Oriental mind the virtues of military character are but two: Filial piety and loyalty. Character is likened unto a cart of which the two wheels are their virtues. Without these wheels the cart is a wreck.

So that even in the Oriental mind, which so often looks at things topsy turvy, loyalty is also the base of all character, military and moral.

Now what are some of the enemies of loyalty?

They are well known and should be guarded against constantly; idle gossip, loose criticism, a willingness to believe the worse; snap judgment without waiting for facts—these are disloyalty to the cause, whether it be embodied in a personality or an ideal.

Lord Jervis, one of the strongest characters in naval history, who brought the British fleet to a high state of discipline at most

turbulent period in its history, voices a warning concerning the danger that lurks in this practice in the wardroom.

Discipline begins in the ward-room. I dread not the seaman. It is the indiscreet conversation of the officers and their presumptuous discussion of the orders received that produce all our ills.

The remedy is simple.

Take no part in such practices, and so far as possible suppress them.

The Oriental idea is illustrated in the group of the three monkeys that with hands over mouth, eyes and ears, respectively; speak no evil, see no evil, hear no evil.

But this is rather a negative attitude, in keeping with the Oriental mind.

We find in St. Paul's Epistle to the Philippians a much more vigorous, a western remedy. Founded, too, on sound psychology:

Whatsoever things are true, whatsoever things are honorable, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report; if there be any virtue, if there be any praise, think on these things.

Here is no mere closing the senses to the evil reports which may all be lies; but an active searching out of the good. "If there be any virtue, if there be any praise think on these things."

But there is a narrow, restricted form of loyalty, that is not a true loyalty, not a "loyalty to loyalty," and that is partisanship.

Against that we must be on our guard. For partisanship is a blind devotion to person or party, it engenders rivalry, jealousy and bitterness. The person no longer feels lifted out of himself and dedicated to a sacred cause. But secretly feels he is responding to the baser motives within, desire for unlawful exercise of power, lust for revenge, unfair advantage. Yet this pseudo-loyalty, this tendency to form cliques, is all too frequent as military history can attest.

The remedy is to choose for our loyalty the ideal, not the personal, not the admiral alone, but the fleet; not the navy alone, but the flag.

I have already quoted from St. Paul, a great leader and the personification of loyalty.

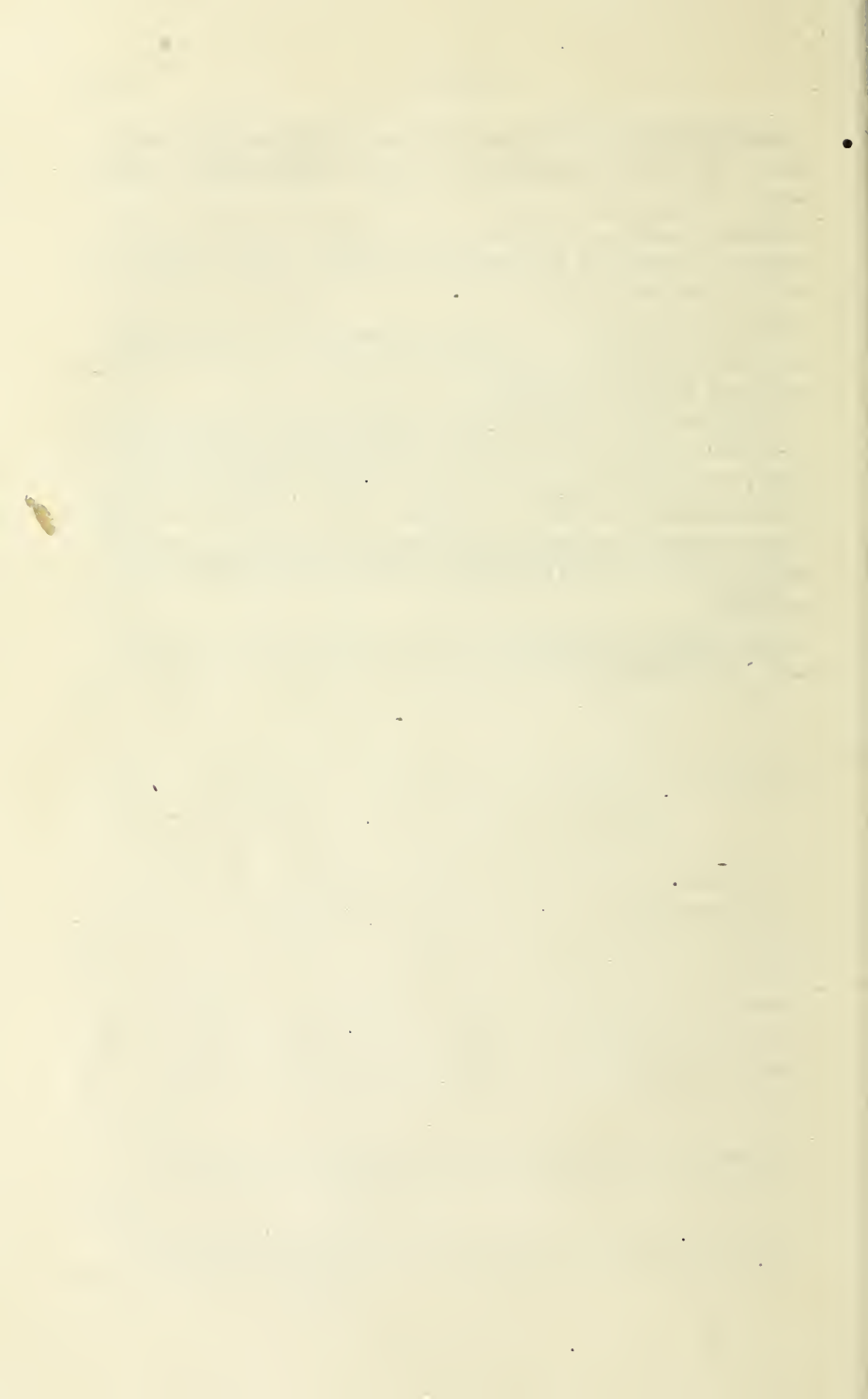
I quote once more from his valedictory written at Rome shortly before his death to Timothy, his beloved fellow-worker in the cause.

For I am already being offered (as a sacrifice) and the time of my departure is at hand; I have fought a good fight; I have finished my course; I have kept the faith.

Here is the message and the wish that we of the graduating class bear to you and to the service, and which we take away in our own heart from this institution.

When the time comes, as come it must, when we shall cease from public service to our country and to our flag, whether it be merely to terminate our active naval careers, and seek repose among family and friends, or whether it be to take our last long cruise to that undiscovered country from whose bourne no traveller returns, may we one and all be able to say freely and conscientiously and gladly :

I have fought a good fight; I have finished my cruise; I have kept the faith; I have been loyal to LOYALTY.



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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

ELASTIC STRENGTH OF RADIALY EXPANDED GUNS

By LIEUT. COMMANDER W. H. P. BLANDY, U. S. Navy

By a "radially expanded" gun is meant a gun which has been subjected to the process of *autofrettage*, or, as it is officially designated in our service, radial expansion. It would seem that we might have adopted a more expressive name by translating the French term literally into "self-hooping." Then our gun would have been "self-hooped." The name, however, makes little difference. What we are interested in is the method, together with its effects upon the gun. It may be said here that although the process is applicable to the construction of guns having more than one layer, the present article deals with one-piece guns only.

For the benefit of those who are not familiar with the process, and who may have missed the article, "Gun Construction by Radial Expansion," by Commodore S. J. Brown (Math. C.), U. S. Navy, published in the PROCEEDINGS for December, 1920, a brief explanation may be worth while. We expand the gun by internal hydraulic pressure, until practically all of the metal has been stressed beyond its elastic limit; then we release the pressure. The metal at the bore, having been the first to yield, plastically, is deformed the most, and if let alone would keep all of its "set." But the outer layers have received very little plastic deformation; their distension is nearly all elastic. Hence, if unobstructed by the more deformed metal nearer the bore, they would return almost entirely to their original dimensions. The result of this conflict of tendencies is a compromise. The inner layers take on a tangential compression, while the outer layers retain part of their tangential tension. The greatest compression is at the bore; the greatest tension at the outer surface; and somewhere near the

middle of the wall there is metal free from tangential stress. The gun is literally "self-hooped."

So much for the definition. Now let us investigate the stresses to which the metal is subjected during this process. In the first place, there is absolutely no longitudinal stress applied, for an arbor running through the bore carries at its ends the packings which effect the hydraulic seal. The endwise hydraulic pressure is thus entirely balanced by the tension which it produces in this arbor. In the gun itself, then, we have only a radial compression and a tangential tension. Each of these, so long as the gun is strained only elastically, has its greatest value at the bore. The metal here is therefore the first to be carried past its elastic limit, and the stresses causing it to pass this limit are therefore a pressure and a tension, acting at right angles to each other.

The first theory which we will consider, purporting to explain the effect of these combined stresses, is that of Captain Charles Duguet, French artillery, as expounded in his "*Limite d'Elasticité et Résistance à la Rupture*," published in 1885. As Commodore Brown mentions in his article, previously referred to, Duguet put forth the argument that the plastic deformation of metals was an entirely different phenomenon from the mere "intermolecular displacement" occurring before the elastic limit was reached. He said it was a slipping of the grains upon one another, or—no matter what the applied stress might be—a *shear*. We know to-day, from microscopic examination of metals during their deformation, that such slipping does take place, even inside the grains, along cleavage planes determined by the system of crystallization.

By Duguet's theory, a compressive stress along the axis of a bar would cause failure by shear along conical surfaces or inclined planes making angles of about 40° with the axis—not 45° , as would appear to be the case at first thought, because he took into account an "internal friction of shear." This friction, he said, was increased by the pressure brought to bear upon the shear-plane by the normal component N of the pressure P . (See Fig. 1.) On the other hand, it was decreased if the axial stress were tension, for in this case the normal component would also be a tensile stress; and shear then occurred on planes or cones making angles of 50° with the axis. It is of interest that the coefficient which Duguet used with the normal component is approximately the same as the coefficient used to-day for static friction between dry metal surfaces.

Proceeding upon this theory, Duguet arrived at the following relations between the elastic limit of tension (E_t), the elastic limit of compression (E_c), and the elastic limit of simple shear (G):

$$0.60E_t = 0.42E_c = G.$$

Hence,

$$E_c = 1.43E_t.$$

A metal subjected, then, to a tension T and a pressure P acting simultaneously at right angles would fail elastically when:

$$0.60T + 0.42P = G.$$

Or,

$$T + 0.70P = E_t.$$

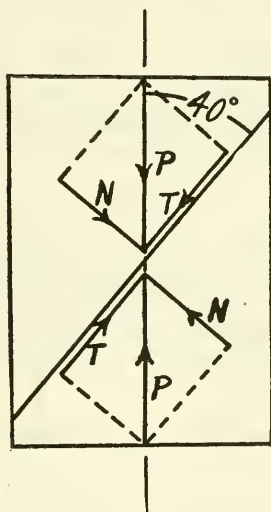


FIG. 1.

There are two other theories for the failure of metals under combined stresses. One is the "elastic limit of strain" theory, which says that a metal subjected to two or more stresses will fail only when the greatest strain in any direction equals the elastic limit of strain shown by test under simple stress—tension or compression, acting singly. Using $\frac{1}{3}$ for "Poisson's ratio," failure would occur when:

$$T + 0.33P = E_t,$$

T being greater than P . If P is greater than T the metal fails when:

$$P + 0.33T = E_c.$$

The third theory is the same as Duguet's, except that it disregards the changes in the internal friction of shear caused by the normal components of the applied stresses. This theory is entertained to-day by M. Pierre Malaval, Ingénieur en Chef d'Artillerie Navale; although in 1912 he published an article in the "Mémorial d'Artillerie Navale," in which he supported the "elastic limit of strain" principle. His later belief would make E_t equal to E_s ; and failure under the two stresses at right angles would take place when:

$$T + P = E_c = E_t.$$

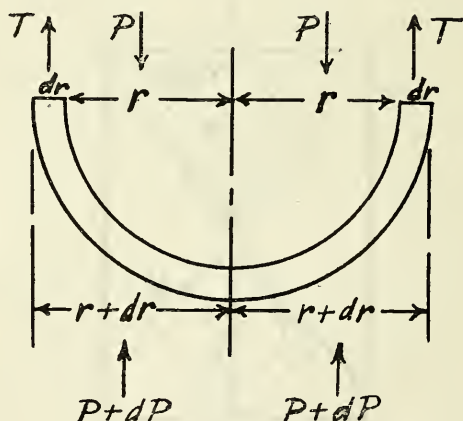


FIG. 2.

Duguet seems to have struck a pretty fair mean between the other two assumptions. Following his work, we find that he combined his equation:

$$T + 0.70P = E_t$$

with the differential equation:

$$rdP + Pdr + Tdr = 0 \text{ (see Fig. 2),}$$

and obtained the following formula for that pressure (P_0) in the bore (radius R_0) which will just bring the outer surface (radius R_1) to the elastic limit of tension:

$$P_0 = 3.33E_t \left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1. \right]$$

This formula does not take into account the increase in the elastic limit of the metal itself, due to its being "cold-worked" beyond this limit. Duguet realized that there was such an increase, but claimed that unless the expanding process was overdone, the deformations would be so slight, even at the bore, as to permit disregarding the effect of this cold-working upon the elastic limit. He admitted, however, that this omission would make the value of P_0 given by his formula slightly low.

Now let us see how well Duguet's formula does agree with practice. There is only one experiment at hand from which complete data can be obtained—the "Emery Process 4-Inch Gun Test." This experiment is fully described in Commodore Brown's article. Fig. 3 of the present study shows the inner and outer radii at four points (or "stations," as they were called in the report of the test) on the Emery gun. It will be observed that at Stations I and II, near the breech and muzzle, respectively, the radii of the gun were:

Station I, $R_1=8.17$ inches; $R_0=2.37$ inches.

Station II, $R_1=6.32$ inches; $R_0=1.78$ inches.

The elastic limit of the metal, determined from tensile test specimens, was:

At breech, outside, $E_t=56,000$ lbs. per sq. in.

At muzzle, outside, $E_t=60,000$ lbs. per sq. in.

Using 30,000,000 as the modulus of elasticity, the "extension of outside diameter" corresponding to the arrival of the outside metal at its elastic limit, in each case, was:

$$\text{Station I, } \delta D_1 = \frac{56,000 \times 16.34}{30,000,000} = 0.0305 \text{ in.}$$

$$\text{Station II, } \delta D_1 = \frac{60,000 \times 12.64}{30,000,000} = 0.0253 \text{ in.}$$

On the first straining, the internal pressures producing the above strains were, as shown by Figs. 4 and 7:

Station I, actual P_0 was 86,000 lbs. per sq. in.

Station II, actual P_0 was 90,000 lbs. per sq. in.

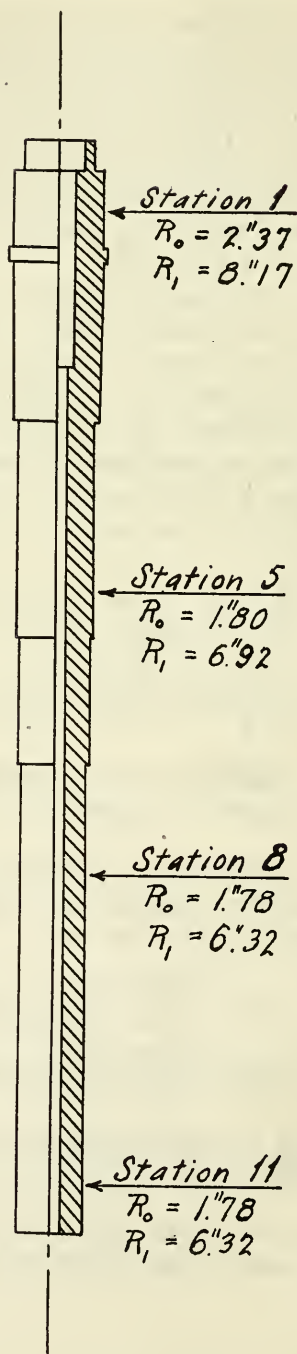


FIG. 3.—Four-inch Emery Gun.

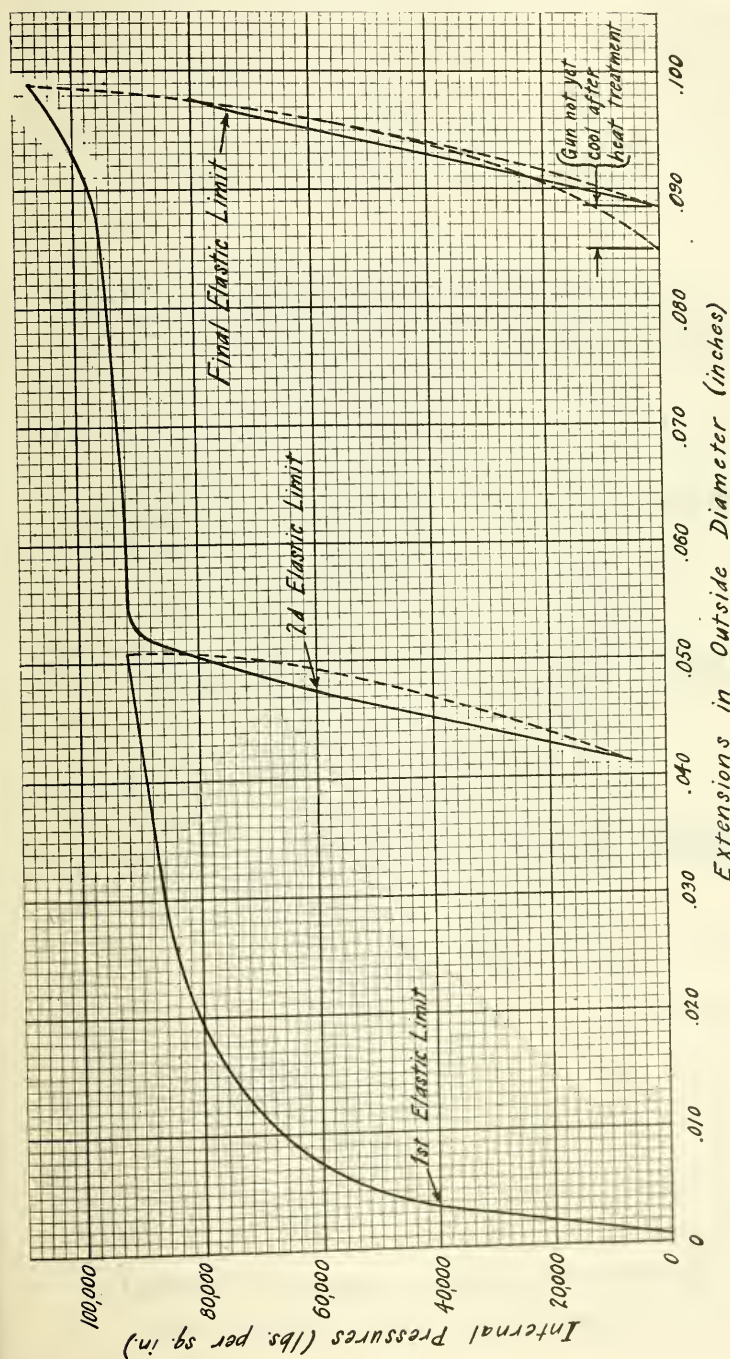


FIG. 4.—Station 1, Emery Gun. Pressures vs. Strains.

By Duguet's formula, these pressures should be:

$$\text{Station I, } P_0 = 3.33 \times 56,000 \left[\left(\frac{8.17}{2.37} \right)^{0.3} - 1 \right] = 84,000 \text{ lbs. per sq. in.}$$

$$\text{Station II, } P_0 = 3.33 \times 60,000 \left[\left(\frac{6.32}{1.78} \right)^{0.3} - 1 \right] = 92,000 \text{ lbs. per sq. in.}$$

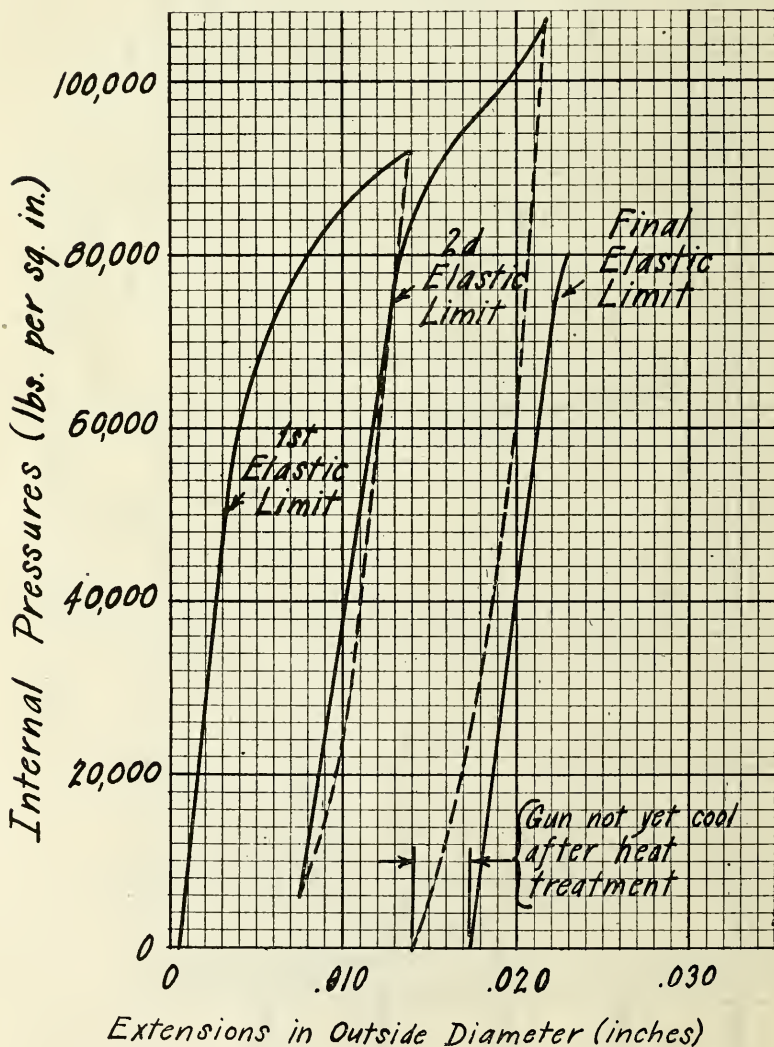


FIG. 5.—Station 5, Emery Gun. Pressures vs. Strains.

The agreement is thus very close at these points. At Stations 5 and 8, longitudinal shear was not so likely to occur as at the breech and muzzle, and undoubtedly higher pressures would have been required than Duguet's formula would give, in order to bring the outside surface to the elastic limit. But we have no exact information on the elastic limit at these intermediate points. We might

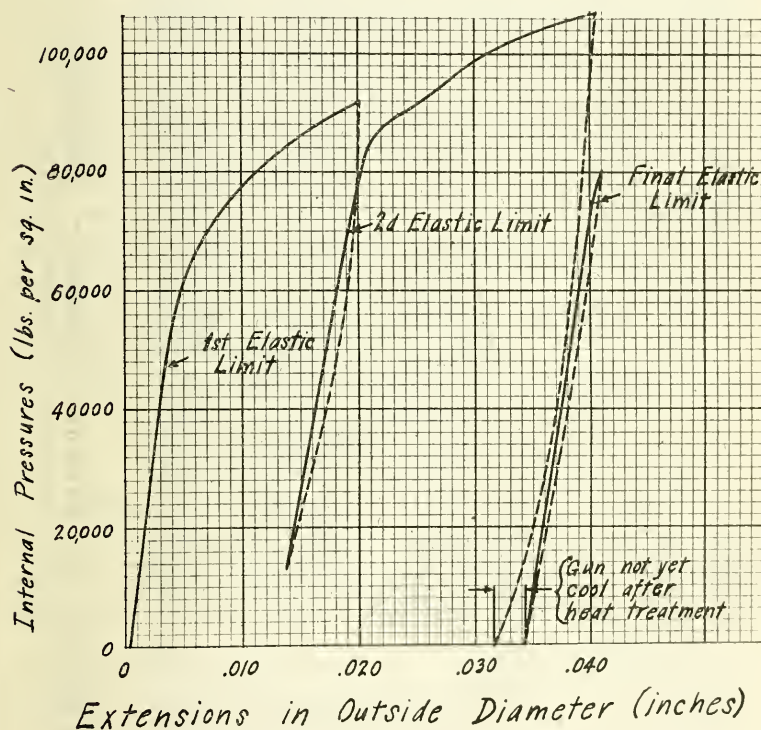
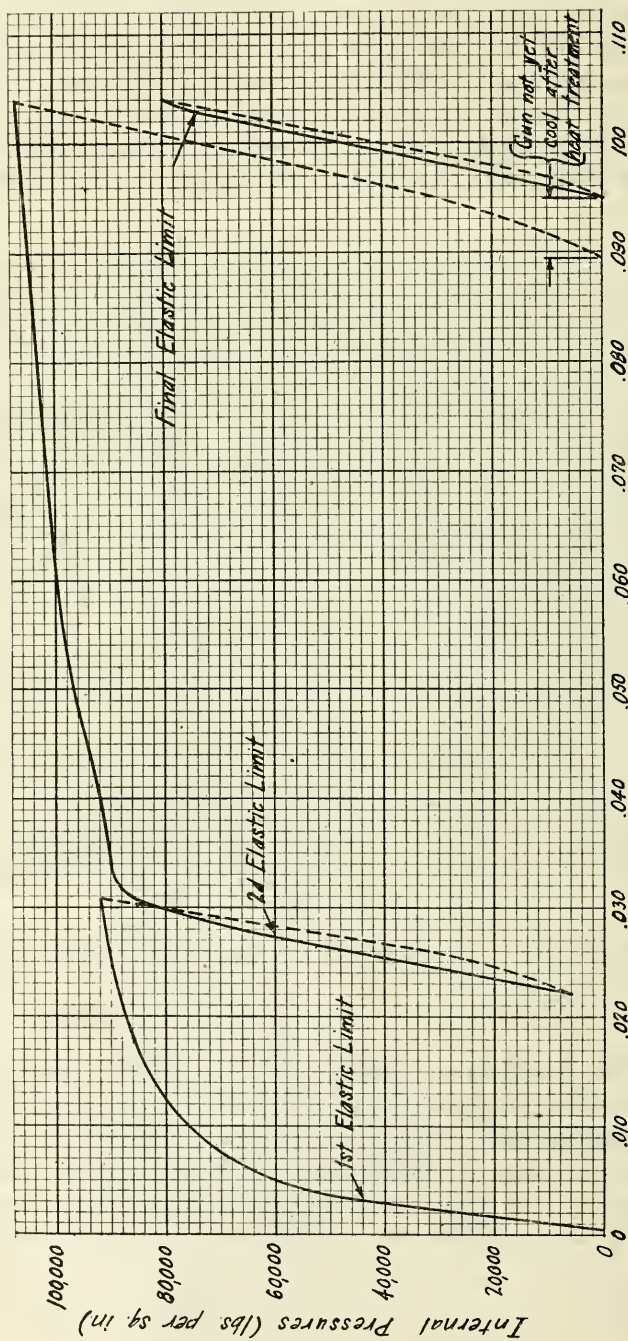


FIG. 6.—Station 8, Emery Gun. Pressures vs. Strains.

assume values based on the wall thickness—for elastic strength imparted by heat treatment does vary in some degree, within the same forging, with the thickness of the wall. Suppose we take 60,000 for E_t at Station 8, where the wall thickness was the same as at Station 11; and 58,000, the mean between 56,000 and 60,000, at Station 5, where the thickness was halfway between the values



Extensions in Outside Diameter (inches)
 Pressures vs. Strains.
 FIG. 7.—Station II, Emery Gun.

at Stations I and II. With these estimates for the elastic limit, the corresponding extensions in outer diameter would be:

$$\text{Station 5, } \delta D_1 = \frac{58,000 \times 13.84}{30,000,000} = 0.0268 \text{ in.}$$

$$\text{Station 8, } \delta D_1 = \frac{60,000 \times 12.64}{30,000,000} = 0.0253 \text{ in.}$$

Figs. 6 and 7 show that these extensions were not reached during the first straining. Data from subsequent strainings would be unsuitable for comparison purposes, on account of the slightly changed characteristics of the metal. Therefore no exact comparison between theory and practice can be made at these points. Assuming, however, from the close "check" at muzzle and breech, that Duguet's equation for P_0 is sufficiently accurate for practical purposes, it now becomes necessary to develop formulas for determining how far we can expand a thick-walled gun without over-compressing the bore in the state of rest. We must also be able to calculate the effect of machining operations, upon the elastic strength produced by the expansion.

Theoretically, the pressure given by

$$P_0 = 3.33 E_t \left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right]$$

can increase indefinitely with $\frac{R_1}{R_0}$; and, considered as the internal pressure needed to bring the outer surface to its elastic limit, it must so increase. But looked upon as the new elastic strength or resistance of the gun, P_0 is limited in practice to that value, dependent upon $\frac{R_1}{R_0}$, which will just bring the surface of the bore to its limit of tangential compression in the state of rest. Now, whether this limit will be raised if it is exceeded or will have already been lowered by the previous cold-working in tangential *tension*, we do not know. Therefore our safest course will be to assume, with Duguet, that the plastic deformations have been so slight, even at the bore, that the elastic limit of compression, as well as that of tension, has been neither raised nor lowered.

To determine, then, the limit of $\frac{R_1}{R_0}$ for which we can afford to expand the gun to the end of the "semi-elastic period," we must obtain an expression for the tangential stress remaining at the

bore after the expanding pressure P_0 has been relieved, and equate this expression to E_c , the elastic limit of compression.

After expansion, even during the return to the state of rest, the gun is considered to be a simple elastic tube. Therefore we may apply the principle of "superposition of stresses" which is used in calculations on built-up guns. In other words, we may add algebraically, to the stresses already existing at any point, any new stresses caused at that point by a new pressure, applied either inside or outside the tube.

The equation universally accepted as showing the relation between tangential tension and radial compression existing simultaneously at any radius r in the wall of a hollow elastic cylinder, is:

$$t_r = p_r \frac{R_1^2 + r^2}{R_1^2 - r^2}.$$

At the bore this becomes:

$$t_0 = p_0 \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2}.$$

Now let T_0 = tangential tension at R_0 under expanding pressure P_0 , and t_0 = tangential tension at R_0 due to adding a new pressure, $p_0 = -P_0$ (*i. e.*, due to relieving P_0), considering the expanded gun now as a simple elastic tube.

Let $T_0 = T_0 + t_0$ = tangential tension, state of rest. If negative, as they will be, t_0 and \bar{T}_0 will be compressions.

By Duguet's theory,

$$T_0 = E_t - 0.7P_0 = E_t - 0.7 \left[3.33E_t \left\{ \left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right\} \right].$$

Whereas,

$$\begin{aligned} t_0 = p_0 \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} &= -P_0 \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \\ &= -3.33E_t \left(\frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \right) \left\{ \left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right\}. \end{aligned}$$

Therefore,

$$\begin{aligned} \bar{T}_0 &= E_t - 0.7 \left[3.33E_t \left\{ \left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right\} \right] \\ &\quad - 3.33E_t \left(\frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \right) \left\{ \left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right\} = E_c = -1.43E_t. \end{aligned}$$

$$\text{Or,} \quad 1 - 3.33 \left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right] \left[0.7 + \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \right] = -1.43$$

$$\left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right] \left[0.7 + \frac{\left(\frac{R_1}{R_0} \right)^2 + 1}{\left(\frac{R_1}{R_0} \right)^2 - 1} \right] = 0.728.$$

Solved graphically, the above equation gives $\frac{R_1}{R_0} = 2.84$. A gun having this ratio of outer and inner radii will have to be subjected to an internal pressure equal to:

$$P_0 = 3.33E_t [(2.84)^{0.3} - 1] = 1.22E_t$$

in order to bring the outer surface to its elastic limit; and this P_0 will also be, thereafter, the elastic strength of the gun, except as modified by "finish machining." To take a concrete example, if the tensile elastic limit of the steel were 60,000 lbs. per sq. in., such a gun after expansion would have an elastic resistance of 73,000 lbs. per sq. in. In the state of rest, the surface of the bore would be under a tangential compression stress equal to $1.43 \times 60,000 = 86,000$ lbs. per sq. in., which, by the Duguet theory, would be the absolute compressive elastic limit of this metal. In the state of action, the entire mass of the gun would be stressed just to its elastic limit, provided the pressure were 73,000 lbs. per sq. in.

Such a gun would certainly be strong enough to resist any powder pressure employed to-day. It might possibly be so light, however, as to throw too much load on the recoil mechanism, or be too "whippy." If, because of such considerations, or for any other reason, it is necessary to have a wall-thickness greater than $1.84R_0$, we cannot expand the gun until the outside surface reaches the elastic limit without incurring the danger of failure by "fatigue of the metal" at the bore. Another consequence of over-expanding a thick-walled gun is that the metal may be enabled by its own inertia to withstand the overcompression at the bore, until the shock of the first few shots destroys this inertia, causes a collapse, and necessitates re-boring the gun. This unpleasant circumstance has been known to occur more than once, in France.

To avoid overcompression of the bore, there are two courses open to us. We may use an expanding pressure less than that called for by the formula, stopping our plastic deformations at some radius R_a less than R_1 ; or we may carry the metal at R_1 far enough *beyond* its elastic limit to lessen its "grip" on the inner layers when the pressure is released. The latter method requires, of course, a considerably higher expanding pressure than the former, while the additional strength is not at all needed. Hence we will treat in this study the first plan only.

To determine the limiting value of R_d , and the corresponding value of P_0 , when $\frac{R_1}{R_0}$ exceeds 2.84, we consider the gun as being composed of two cylinders (Fig. 8), the inner having radii R_0 and R_d , and the outer, R_d and R_1 . The metal within R_d has reached its elastic limit, while that beyond R_d is in the purely elastic stage. Thus we have at R_d a radial compression or pressure P_d and a tangential tension T_d such that

$$T_d + 0.7P_d = E_t.$$

Hence our formula for P_0 , which assumes no external pressure, will not be correct, even for the "inner cylinder."

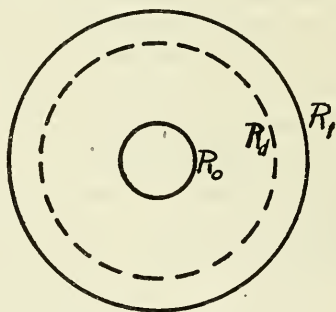


FIG. 8.

Going back to the two equations with which Duguet started,

$$r dP + P dr + T dr = 0, \quad (1)$$

and

$$0.42P + 0.60T = G, \quad (2)$$

we combine the two, integrate, and obtain:

$$\left(P + \frac{G}{0.18}\right)(r)^{0.3} = K$$

where K is the constant of integration. Making $P = P_0$ at $r = R_0$, and $P = P_d$ at $r = R_d$, and substituting $3.33E_t$ for $\frac{G}{0.18}$, we have:

$$(P + 3.33E_t)(R_0)^{0.3} = K = (P_d + 3.33E_t)(R_d)^{0.3}.$$

Therefore,

$$P_0 = (P_d + 3.33E_t) \left(\frac{R_d}{R_0}\right)^{0.3} - 3.33E_t, \quad (3)$$

and

$$T_0 = E_t - 0.7P_0.$$

Now at R_d we also have:

$$T_d = P_d \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2},$$

which, with

$$T_d + 0.7P_d = E_t$$

gives

$$P_d = \frac{E_t}{0.7 + \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2}}. \quad (4)$$

Hence,

$$P_0 = E_t \left[\left(\frac{1}{0.7 + \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2}} + 3.33 \right) \left(\frac{R_d}{R_0} \right)^{0.3} - 3.33 \right].$$

Now

$$\bar{T}_0 = T_0 + t_0 = E_t - 0.7P_0 - P_0 \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} = E_c = -1.43E_t.$$

Or,

$$P_0 \left(0.7 + \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} \right) = 2.43E_t$$

$$P_0 = \frac{2.43E_t}{0.7 + \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2}}. \quad (5)$$

Therefore,

$$\frac{2.43E_t}{0.7 + \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2}} = E_t \left[\left(\frac{1}{0.7 + \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2}} + 3.33 \right) \left(\frac{R_d}{R_0} \right)^{0.3} - 3.33 \right].$$

This reduces to:

$$\frac{\left(\frac{R_d}{R_0} \right)^{0.3}}{1.7 \left(\frac{R_1}{R_0} \right)^2 + 0.3 \left(\frac{R_d}{R_0} \right)^2} - \frac{1.214 - 0.214 \left(\frac{R_0}{R_1} \right)^2}{1.7 \left(\frac{R_1}{R_0} \right)^2 + 0.3} = 0.$$

The above equation can be plotted as a curve having as abscissæ various values of $\frac{R_1}{R_0}$ and as ordinates the corresponding values of

$\frac{R_d}{R_0}$, so that whenever $\frac{R_1}{R_0}$ exceeds 2.84, the proper value for R_d may be found from the curve (see Fig. 9). Then, knowing E_t , R_1 , R_0 and R_d , we may find P_d and then P_0 , from formulas (4) and (3), respectively. P_0 could be obtained more easily, of course, from formula (5), but, as will be shown later, it is necessary to

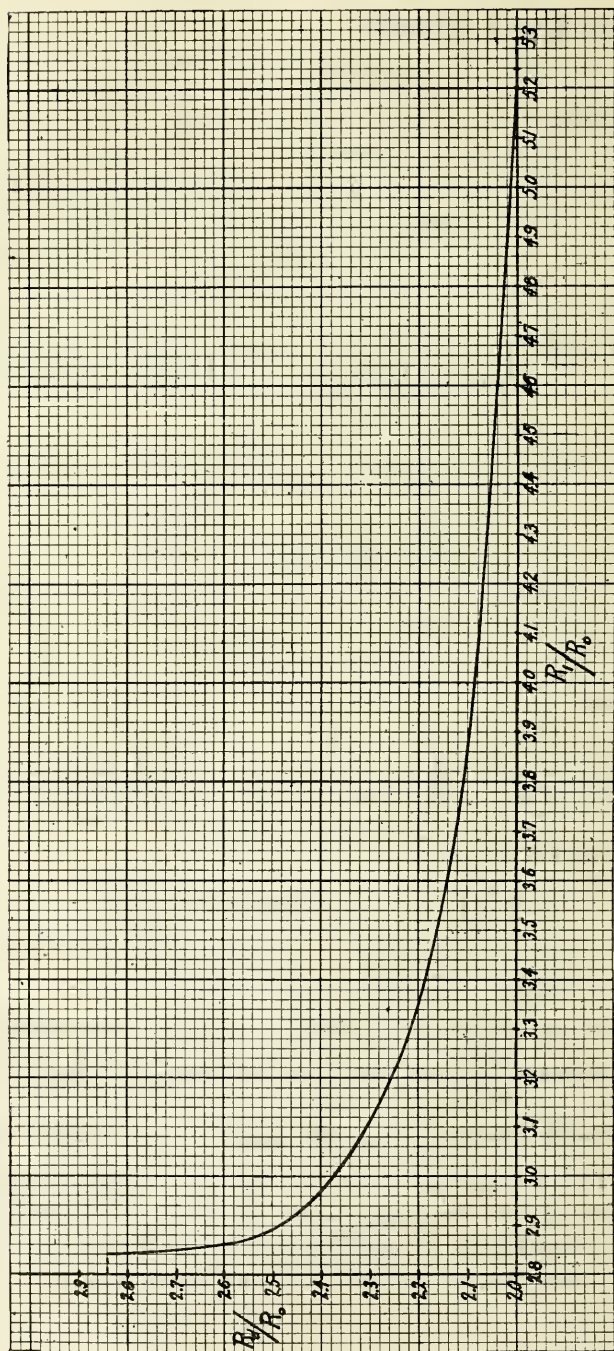


FIG. 9.—Curve for obtaining R_i , knowing R_o and R_i .

determine R_d , P_d and T_d in order to make the final strength calculations.

At this point it is desired to call attention again to the Emery gun, Fig. 3. The ratio of radii at Station 5 being $\frac{6.92}{1.80}$, or 3.84, the corresponding value of $\frac{R_d}{R_0}$, from our curve, is seen to be 2.10.

R_d , then, should be 3.78 inches. Assuming $E_t = 58,000$ lbs. per sq. in., the corresponding value of P_0 , from our formulas, would be 77,000 lbs. Now, as Fig. 6 shows, the actual pressure in the Emery gun was carried, on the second straining, up to 107,000 lbs.; and if there had been no overcompression of the bore on the return to rest, it should have been possible for the gun to withstand nearly the full 107,000 lbs. *elastically* thereafter. But, after the heat treatment designed to "set" the increased elastic strength of the metal had been applied, and the gun was again subjected to internal pressure, it was found that the new elastic strength of the gun was only about 75,000 lbs. (see Figs. 4, 5, 6 and 7). Does it not seem reasonable to say, then, that the rest stresses after the 107,000-lb. pressure was relieved, were practically the same as they would have been after applying only 77,000 lbs.? After applying and relieving the latter pressure, the bore would have been compressed to its elastic limit. A higher P_0 could not make it withstand a greater compression, and could therefore accomplish no increase in the elastic strength of the gun.

Now, as we have already stated, the gun, after the expansion process, may be treated as a simple elastic cylinder, containing different "initial" or "rest" stresses at the various points throughout its wall. The next question is: What happens to these rest stresses, and to the elastic strength of the gun (which we have assumed equal to P_0 , the expanding pressure), when we remove metal, both inside and outside, in machining the gun to finished dimensions? Certainly the thinning of the wall is not the only effect. The compression at the new bore and the tension at the new outer surface will certainly be less than the original surface stresses were. In fact they cannot even be expected to retain their own former values, unless the amount of metal removed at each surface was practically the same. To illustrate this point more clearly, suppose that we turned the outer surface down until we reached that point near the middle of the

wall where the metal had been free from tangential stress. Would it now be free from stress? Hardly; the tangential compression at R_0 would have relieved itself, as the turning progressed, by distending all the layers exterior to it, so that when we arrived at the former "middle of the wall," we should find it in a state of

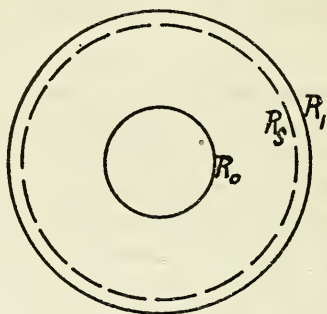


FIG. 10.

tension. And another cylindrical surface, approximately halfway between this point and the bore, would be the new "layer free from stress."

To take care of this effect of machining operations, it seems logical to continue our "superposition of stresses" principle. In

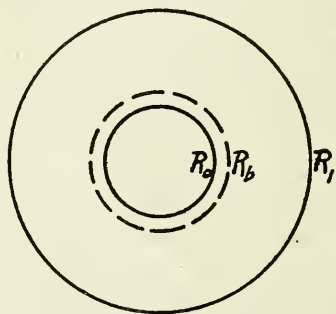


FIG. 11.

other words, consider our gun, before the outer metal was removed by turning, to be composed of two parts, with a contact surface at R_s (see Fig. 10). At this contact surface there is a radial rest pressure P_s . Removing the outer "hoop" relieves this surface of its contact pressure, and thus P_s vanishes. Hence the effect on all

the rest stresses in the remaining "inner tube" is the same as if a new pressure, $p_s = -\bar{P}_s$, had been applied at R_s .

Likewise, boring the gun out from R_0 to R_b (see Fig. 11) is equivalent to applying at R_b a new pressure $p_b = -\bar{P}_b$.

Now, while it might be of interest from a purely theoretical point of view, to determine the separate effects upon the stresses in the gun, caused by: (1) releasing the expanding pressure, (2) boring the gun to the finished diameter, and (3) turning down the outside surface to finished dimensions, all we need to know for practical purposes is the combined effect of all three operations, so that we may determine directly, from the action stresses, the final rest stresses, and from these the final elastic strength of the gun.

Let R_1 and R_0 = Outside and inside radii at time of expanding.

R_s and R_b = Outside and inside radii after finish machining.

P_s and P_b = Pressures or radial compressive stresses, at R_s and R_b , under expanding pressure P_0 .

T_s and T_b = Tangential tensile stresses at R_s and R_b , under expanding pressure P_0 .

t_s and t_b = Tangential tensile stresses at R_s and R_b due to $p_s = -P_s$ applied at R_s and $p_b = -P_b$ applied at R_b (caused by releasing P_0 , and by boring and turning).

\bar{T}_s and \bar{T}_b = Tangential tensile stresses at R_s and R_b , under and R_b .

CASE I.—When $\frac{R_1}{R_0} \leq 2.84$.

$$P_0 = 3.33E_t \left[\left(\frac{R_1}{R_0} \right)^{0.3} - 1 \right].$$

$$P_s = 3.33E_t \left[\left(\frac{R_1}{R_s} \right)^{0.3} - 1 \right].$$

$$P_b = 3.33E_t \left[\left(\frac{R_1}{R_b} \right)^{0.3} - 1 \right].$$

$$T_s = E_t - 0.7P_s.$$

$$T_b = E_t - 0.7P_b.$$

$$t_s = \frac{P_s(R_s^2 + R_b^2) - 2P_bR_b^2}{R_s^2 - R_b^2}.$$

$$t_b = \frac{2P_sR_s^2 - P_b(R_s^2 + R_b^2)}{R_s^2 - R_b^2}.$$

$$\bar{T}_s = T_s + t_s.$$

$$\bar{T}_b = T_b + t_b.$$

The final elastic strength of the gun is equal to that pressure in the finished bore which will just bring the finished outer surface to its elastic limit. This is:

$$P_b' = \frac{(E_t - \bar{T}_s)(R_s^2 - R_b^2)}{2R_b^2}.$$

This P_b' will not quite bring the bore to its elastic limit, unless no metal has been removed at R_1 . In this case, of course, $P_b' = P_b$. But in any case, the above formula will determine correctly the final elastic strength of the gun.

CASE II.—When $\frac{R_1}{R_0} > 2.84$.

When $\frac{R_1}{R_0} > 2.84$, our limiting radius of deformations is not R_1 , but R_d , whose relation to R_0 , it will be remembered, is governed by the stipulation that the metal at R_0 should not be compressed beyond its elastic limit in the state of rest. But in practice we are concerned with the compression at the *final bore*, R_b , which may be quite different from R_0 . For instance, in order to simplify the expanding apparatus, we may have a uniform bore throughout the gun, during expansion, and then chamber it afterwards. In such a case, if we carried our deformations only to that R_d which would bring the *metal at* R_0 to its elastic limit upon relieving P_0 , then, after we chambered the gun, we might easily find that the final elastic strength, P_b' , would be entirely too low to be acceptable. Whereas, if we permit the metal at R_0 to be slightly crushed, and choose the higher value of R_d which will leave the *metal at* R_b at the elastic limit of compression after chambering, we shall have accomplished a considerable gain in the strength of the gun, while at the same time leaving the finished bore free from overcompression.

To find this higher value of R_d , we use $\frac{R_1}{R_b}$ instead of $\frac{R_1}{R_0}$ as the abscissa of the curve, Fig. 9, and call the corresponding ordinate $\frac{R_d}{R_b}$ instead of $\frac{R_d}{R_0}$.

Then:

$$R_d = \frac{R_d}{R_b} \times R_b.$$

$$P_d = \frac{E_t}{0.7 + \frac{R_1^2 + R_d^2}{R_1^2 - R_d^2}}.$$

$$P_o = (P_d + 3.33E_t) \left(\frac{R_d}{R_o} \right)^{0.3} - 3.33E_t.$$

$$P_b = (P_d + 3.33E_t) \left(\frac{R_d}{R_b} \right)^{0.3} - 3.33E_t.$$

$$T_b = E_t - 0.7P_b.$$

P_s and T_s are found as follows: If $R_s = R_d$, then of course $P_s = P_d$ and $T_s = E_t - 0.7P_d$. If $R_s < R_d$, then

$$P_s = (P_d + 3.33E_t) \left(\frac{R_d}{R_s} \right)^{0.3} - 3.33E_t.$$

$$T_s = E_t - 0.7P_s.$$

If $R_s > R_d$, then

$$P_s = P_d \frac{R_d^2}{R_s^2} \left(\frac{R_1^2 - R_s^2}{R_1^2 - R_d^2} \right).$$

$$T_s = P_d \frac{R_d^2}{R_s^2} \left(\frac{R_1^2 + R_s^2}{R_1^2 - R_d^2} \right), \text{ or } P_s \left(\frac{R_1^2 + R_s^2}{R_1^2 - R_s^2} \right).$$

Now, knowing P_b and T_b , \bar{P}_s and T_s , we may find t_b , t_s , \bar{T}_b and \bar{T}_s from the formulas given for these stresses under Case I.

Then, if $R_s \leq R_d$, the final elastic strength, P_b' , is:

$$P_b' = \frac{(E_t - \bar{T}_s)(R_s^2 - R_b^2)}{2R_b^2}, \text{ as in Case I.}$$

If $R_s > R_d$, the final elastic strength will be equal to that pressure in the finished bore which will just bring the metal at R_d to its elastic limit, as was the case during expansion. This pressure is found as follows:

$$t_d = \frac{P_s R_s^2 (R_d^2 + R_b^2) - P_b R_b^2 (R_s^2 + R_d^2)}{R_d^2 (R_s^2 - R_b^2)}.$$

$$\bar{T}_d = T_d + t_d = E_t - 0.7P_d + t_d.$$

$$p_d = \frac{P_s R_s^2 (R_d^2 - R_b^2) - P_b R_b^2 (R_s^2 - R_d^2)}{R_d^2 (R_s^2 - R_b^2)}.$$

$$\bar{P}_d = P_d + p_d.$$

$$P_b' = \frac{R_d^2 (R_s^2 - R_b^2) (E_t - \bar{T}_d - 0.7\bar{P}_d)}{R_b^2 (1.7R_s^2 + 0.3R_d^2)}.$$

One more formula will be found useful—that for determining the tension at R_1 due to the expanding pressure P_0 in the bore. Where $\frac{R_1}{R_b} \leq 2.84$, this tension, T_1 , is equal to E_t . Where $\frac{R_1}{R_b} > 2.84$,

$$T_1 = \frac{2P_d R_d^2}{R_1^2 - R_d^2}.$$

Knowing T_1 , we also know the increase in outside diameter due to it:

$$\delta D_1 = 2R_1 \frac{T_1}{M},$$

where M is the modulus of elasticity, usually considered to be 30,000,000.

Thus we may know when the internal expanding pressure has reached its proper value, by measuring this increase in the outside diameter. For two reasons, this measurement should be used as the criterion for controlling the expanding pressure. In the first place, the diametral extension (or circumferential extension, as preferred), is easier to measure, continuously and with accuracy, than the extremely high pressures employed in radial expansion. In addition, it is admitted that Duguet's P_0 may have to be slightly exceeded to obtain the required T_1 , except, perhaps, near the breech and muzzle. At any rate, by expanding the gun with a pressure slightly greater than P_0 , and afterward assuming that our new resistance or elastic strength is only equal to P_0 (or P_b' , based upon P_0), we are erring on the side of safety.

Examples of the action and rest stresses throughout the wall of a radially expanded gun are shown in Figs. 12 and 13. An elastic limit of tension equal to 60,000 lbs. per sq. in. is assumed, making the elastic limit of compression 86,000 lbs. For simplicity, modifications of rest stresses due to machining are omitted.

In Fig. 14 there is shown a hypothetical monoblock gun of the same finished dimensions as one of our built-up guns. The dotted outline represents the forging from which the gun presumably would be made. Note that this forging, considered to be machined ready for the expansion process, is of uniform bore. The four different values of R_1 , however, require four different solutions for P_0 , as is indicated by the "expanding pressure" curve. Furthermore, the many changes of outside diameter in the finished gun necessitate a complete solution for P_b' and \bar{T}_b at 12 points.

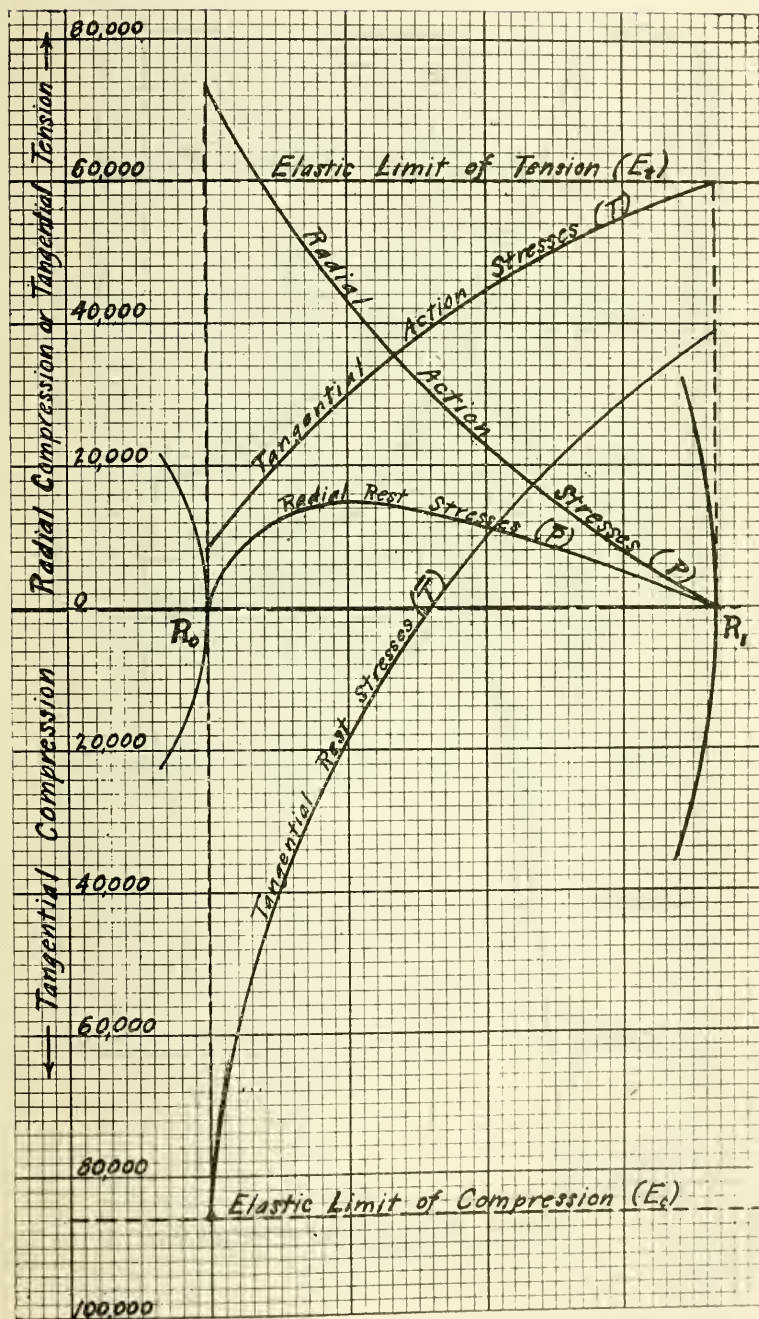


FIG. 12.—Stresses throughout the wall of a self-hooped gun in which $R_1/R_0 = 2.84$.

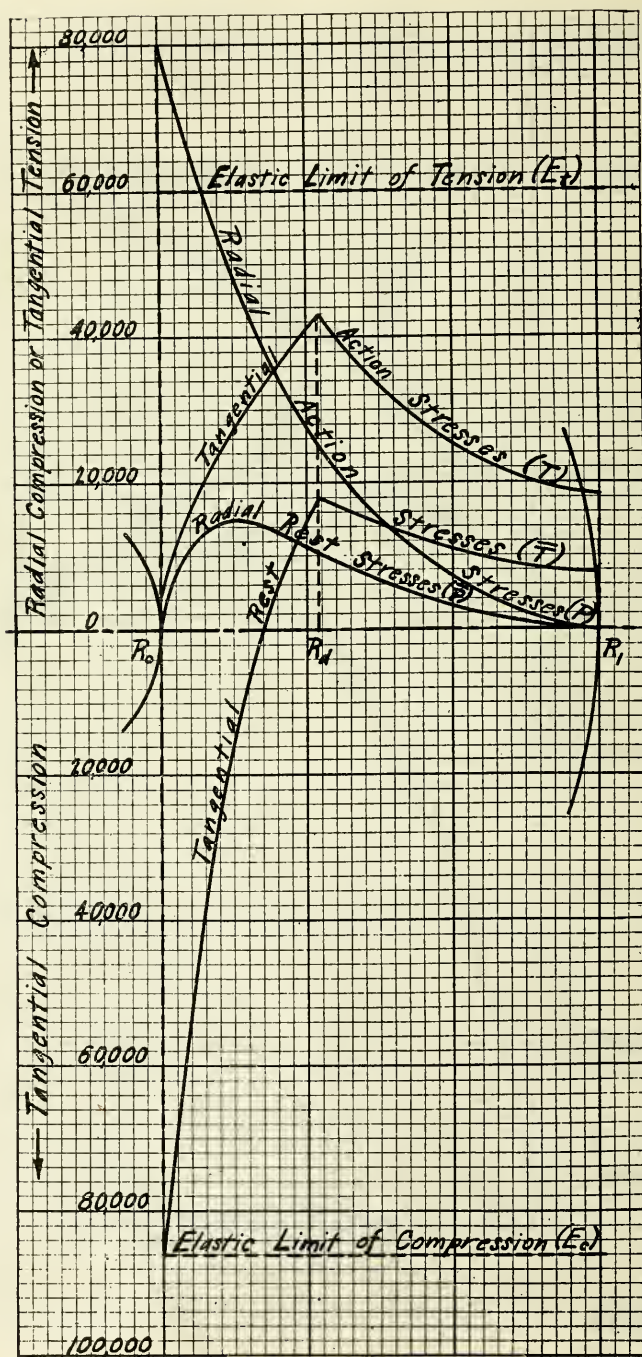


FIG. 13.—Stresses throughout the wall of a self-hooped gun in which $R_d/R_0 = 4$

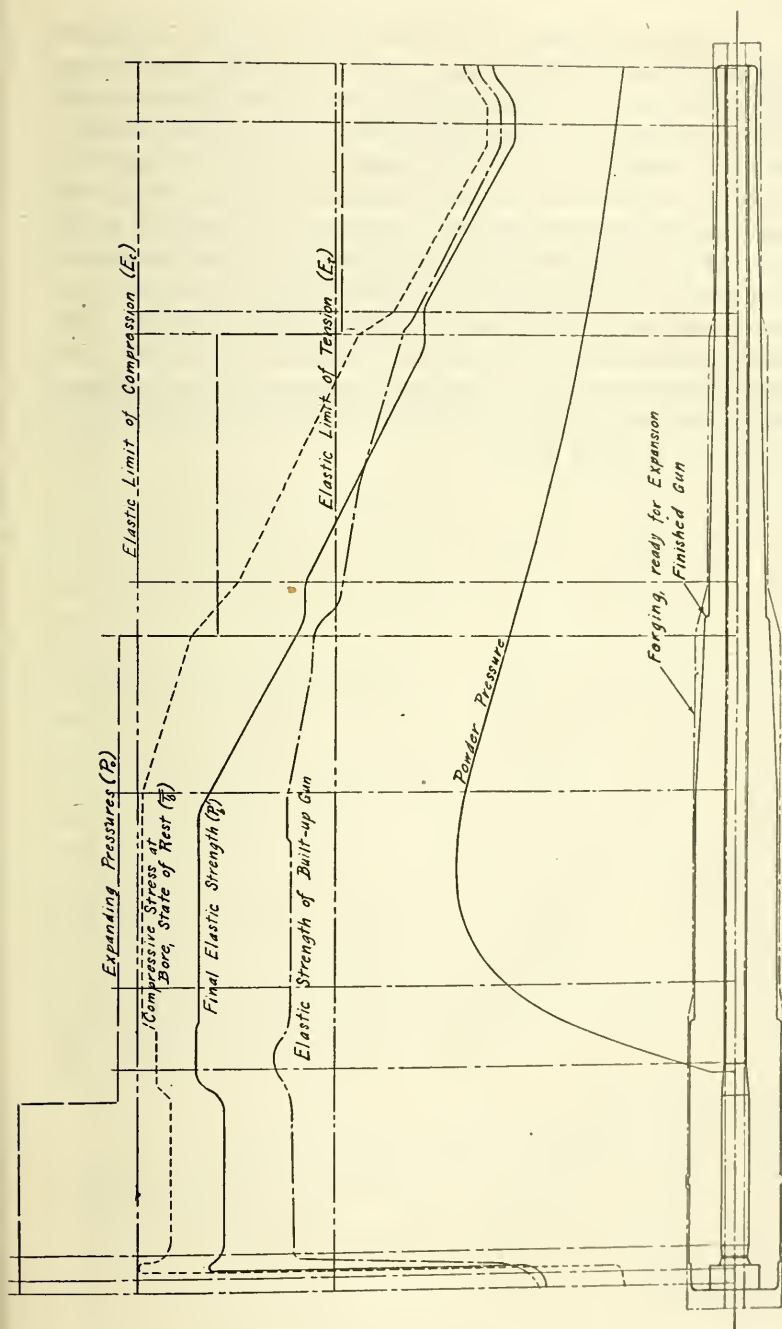


FIG. 14.—Pressure and strength curves for hypothetical self-hooped gun of same overall dimensions as one of our present built-up guns.

A comparison between the strength curve of the self-hooped gun and that of the built-up gun can hardly be made with fairness, without first taking into account the fact that the elastic strength of the built-up gun was calculated upon the "elastic limit of strain" principle, which gives the metal credit for greater resistance to combined stresses than does the Duguet theory. In spite of this discrepancy between the methods of calculation, however, it may be observed that the curve of the radially expanded gun almost coincides with that of the built-up gun from the muzzle halfway to the breech, and lies above it where the highest powder pressures occur. This particular built-up gun has its lowest factor of safety at the point of maximum powder pressure; whereas the corresponding self-hooped gun would have practically a uniform factor of safety throughout its entire length.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

A MYSTERY OF THE SEAS

By JAMES MORRIS MORGAN

Who can solve the secrets of the mighty deep which in its calmer moods lulls us to sleep and in its anger arouses us to fight for our lives?

Tennyson and Jules Vernes dreamed dreams, one in verse and the other in prose, of mighty fleets battling in the air, and ships that navigated under the surface of the seas. After they were dead, we, the living, saw the realization of what was once called their impossible reveries. But will the mystery of the *Marie Celeste* ever be solved? This was a case of a ship under full sail, with everything aboard in shipshape and "Bristol" fashion; the dinner table set, and dinner on the captain's table, while the child's dress the captain's wife was working on lay unfinished by the side of the sewing machine. The child's toys were lying on the deck, and the mate's watch was hanging on a nail at the head of his berth. There was not a sign of anything having been disturbed on the ship, and no boat had been lowered. But never again has been seen the captain, his wife and little daughter, or the crew of the *Marie Celeste*.

Now here is another mystery of the sea which was not the fruit of some dreamer's imagination, but is culled from the dry pages of the "United States Naval War Records" and it may well give psychological students cause for thought. Now please mark well the dates.

U. S. S. *Wachusett*

At Sea, Lat. 4° 6' S., Long. 33° 37' W., April 11, 1864.

Sir: I have the honor to report that since leaving Bahia we visited Pernambuco and, yesterday, the island of Fernando de Noronha.

All on board are well.

Very respectfully, your obedient servant,

N. COLLINS,
Commander.

Hon. Gideon Welles,
Secretary of the Navy, Washington, D. C.

(Enclosure.)

Captain Babcock, of American whaler *Lydia*, was informed by an English merchant at Hobart Town, a man of good standing and reliable, whom he feels sure would not attempt to deceive him (although it is possible that the merchant himself might have been deceived) that there was a steamer fitting out in England called the *Sea King*. She was to be ready to sail from England by middle of January. She was to proceed to Australia, calling en route at some place on Van Diemens Land for coal. Her object was to prey on the whalers in that sea. The merchant received his information from a person who had it from the agent of the vessel.

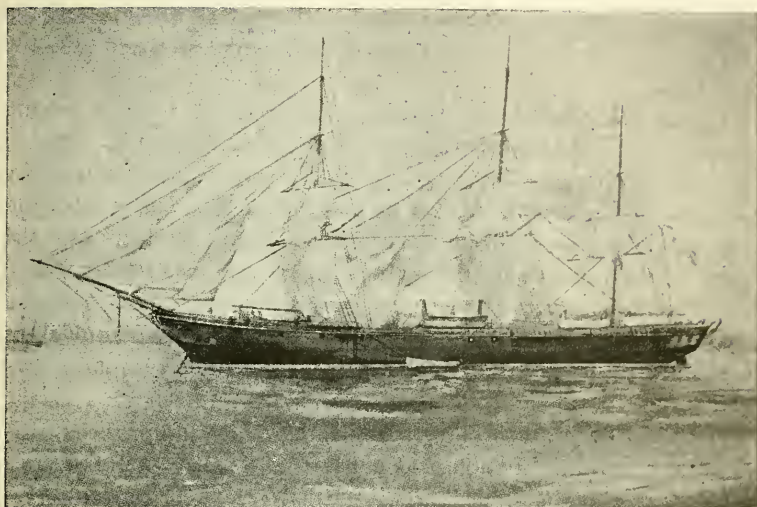
. . . . The above is a statement made by Captain Babcock, by whom we send a mail. Although the statement is not very likely to be true in all particulars, it may be well to ascertain if there is any truth in it.

N. COLLINS,
Commander.

(April 11, 1864.)

See Naval War Records, Vol. 3, p. 10.

The information contained in the enclosure of Captain Collins' report was supposed to come from England via Hobart Town, in Van Diemens Land, or Tasmania, as it is now called, and its transmission to that port by sailing vessel would have required at least 100 days, and its transference from Hobart Town, via the Cape of Good Hope route, to within four degrees of the equator, at a point situated about in the middle of the Atlantic Ocean, by a leisurely and loitering whaling ship while engaged in her vocation must have required 140 days as a minimum. This rough calculation takes us back at least eight months prior to the time, April 11, 1864, which would be about August, 1863, when the rumor left the shores of England. Now it was not until the month of November, 1863, three months after the story told Captain Collins by the whaler in the middle of the lonely south Atlantic Ocean, that the keel of a vessel was laid in a Clyde shipyard that was intended for service in India waters and she was built unusually strong to enable her to fulfill the British government requirements to qualify her for charter in the transport business. When finished she was full ship rigged with very lofty masts and she was very heavily sparred. As she was not over 1000 tons' burden, much of her cruising on her long journeys was expected to be done under sail and to facilitate her slipping through the water her two-bladed screw could be triced up above the water-line. Her engine was of 850 horsepower.



UNITED STATES STEAMER "WACHUSETT."



CONFEDERATE STATES STEAMER "SHENANDOAH."

Taking on board a cargo for the East Indies she sailed for Bombay. There was no Suez Canal in those days so she made the voyage around the Cape of Good Hope—and her name was the *Sea King*.

It was soon discovered that she was too small to be a paying proposition in the transport business, so she returned to London and was discharging her cargo at the East India dock where she was seen by Lieutenant Whittle of the Confederate Navy, who told Captain James D. Bulloch about her. Captain Bulloch was the agent of the Confederate Navy department and was the man who fitted out the famous Confederate commerce destroyers, *Alabama* and *Florida*, the latter ship having been captured by Captain Collins in the neutral harbor of Bahia, Brazil. Incidentally, Captain Bulloch was the maternal uncle of ex-President Roosevelt.

Captain Bulloch determined to buy the *Sea King* and the purchase was consummated on September 16, 1864, five months after the date of Captain Collins' report (April 11, 1864) to the Secretary of the United States Navy of what Captain Babcock of the whaler *Lydia* had told him of the conversation he, Babcock, had had with the reliable English merchant in Hobart Town, Tasmania, several months previously and how the English merchant had not only told him the name of the future Confederate commerce destroyer, but also her destination.

Those of us, Confederate naval officers, who came into intimate contact with Captain Bulloch while waiting for ships in Europe can testify as to how uncommunicative he was to us, and it seems utterly impossible that he should have told any outsider that he was going to fit out and send to Australia a cruiser called the *Sea King*, for the simple reason that at that time there was no such ship in existence, and if she had been in existence she surely did not belong to the "Southern Confederacy" and no one connected therewith had ever heard of her; and yet in Bulloch's minute instructions to Captain Waddell of the C. S. Cruiser *Shenandoah* he uses almost the identical words quoted by Captain Babcock as to what the British merchant had told him nearly a year previous to October 5, 1864. (See Naval War Records, Vol. 3, p. 749.)

Immediately after the consummation of the sale of the *Sea King* to Captain Bulloch's English agent, she was filled up with coal and cleared for a voyage to Bombay under the command of a Captain Corbett, another English agent of Bulloch's.

Early on the morning of October 8, 1864, the *Sea King* cast off the lines which held her fast to the East India docks just as young Lieutenant Whittle (formerly of the United States Navy) climbed aboard via the fore chains and announced himself as being a "Mr. Brown," the supercargo. Whittle had already earned a splendid reputation for gallantry in the Confederacy and he was to be the executive officer of the new commerce destroyer that was to be; and no one else on board with the exception of Captain Corbett either knew his identity or the ultimate use for which the ship was intended.

On the same day that the *Sea King* left London a very fast, light-draft screw steamer, nominally English, but in reality a blockade runner belonging to the Confederate Government and commanded by a Confederate naval officer, left Liverpool supposedly bound for Havana, Cuba. There were a few passengers on board of her and they were the officers for the new cruiser. Her cargo consisted of guns and ammunition. But no one on board of the *Laurel*, with the exception of Lieutenant Waddell, who was to command her, knew the name of the ship they were to join or where they were to meet her. The two ships met near an uninhabited and rocky island called "Desertas," not very far from Madeira, where the officers, guns and ammunition were transferred from the *Laurel* to the *Sea King*, but the sailors, with only a few exception, refused to enlist in the new service. Captain Corbett handed to Captain Waddell a bill of sale for the *Sea King* and then went on board of the *Laurel*.

It was on October 20, 1864, that the Confederate flag was hoisted to the peak of the *Sea King*, the ship that Captain Babcock of the whaler *Lydia* had told Captain Collins of the *Wachusetts* about six months previously while in the lonely South Atlantic. As the Confederate ensign touched the peak Captain Waddell announced that henceforth the name of the ship would be *Shenandoah*, and he then proceeded to read his commission and orders. This finished, the new cruiser got under way.

So unprepared for being a man-of-war was this merchant ship so suddenly converted into a cruiser that port holes for her guns had not as yet been even cut in her sides, and so short handed was she that her officers took off their coats and went to work mounting and securing the guns while Captain Waddell, by way of furnishing one more pair of hands, took the wheel and steered the ship

himself, and she was headed for Australia where she was recoaled and refitted and from whence she proceeded to destroy the whaling fleet in the Pacific Ocean exactly as the British merchant had told Captain Babcock while he was in Tasmania a year previously, and before the *Sea King* had been built, that she would do.

Common people would call the British merchant's tale to Captain Babcock a case of "second sight," but whatever it was, the solution of the mystery must be left to those who delight to delve into the occult or the wonders of telepathy. The writer, a mere sailor, can only give the facts as culled from the pages of that very matter-of-fact government publication yclept "The U. S. Naval War Records."

The story of the cruise of the *Shenandoah*, alias *Sea King*, the "ship without a country," is a most interesting one, but suffice it to say here that she kept the seas for 12 months and 17 days during which time she captured 38 vessels of which number she burned 32, mostly whalers.

She was cruising in the North Pacific and it was not until four months after the surrender of General Lee, and the end of the Southern Confederacy, that she compelled the British bark *Barraconta* to "heave to" and from that vessel learned that her *de facto* nationality had ceased to exist several months previously. Upon the receipt of this news Captain Waddell at once ordered the dismounting of his guns, which were placed in the hold, and the disarming of his crew to protect them against being treated as pirates in case they were captured by a United States man-of-war, and then commenced the long and lonely voyage, under sail alone, to Liverpool, and despite the fact that the cruisers of the United States were scouring the oceans in search of her, the *Shenandoah* was never spoken by a single ship throughout the long voyage. She arrived safely at Liverpool on November 8, 1865, and there surrendered to the British Government. The last Confederate flag was hauled down, and forever disappeared from the seas.

The *Shenandoah* was next turned over to the United States authorities by the British Government and she was placed under the command of a Captain Freeman with orders to take her to America, but encountering bad weather, and losing some sails and spars, she returned to England where shortly afterwards she was sold to the Sultan of Zanzibar, and while in his service she became

a total wreck through having struck a coral reef in the Mozambique channel in 1879.

It may interest the reader to be reminded that it was Captain Napoleon Collins who, in the sloop-of-war *Wachusett*, rammed, boarded and captured, in the middle of the night, and in the neutral harbor of Bahia, Brazil, the Confederate cruiser *Florida* and sent her with a prize crew to Hampton Roads. The Brazilian Government having demanded an apology and the return of the captured ship, an army transport *accidentally* (?) ran her down and sank her at her anchors. To those in the "know" there was nothing occult about this.

DISCUSSION

Psychology and the Navy

(SEE PAGE 393, WHOLE No. 217)

LIEUTENANT (J. G.) F. H. GILMER, U. S. NAVY.—In the March number of the PROCEEDINGS Lieut. Commander McIntosh very ably discussed my article on "Psychology and the Navy." There are, however, a few statements that I will endeavor to refute, these statements to follow in the order in which they are found in the original discussion. I have answered each statement separately because I believe that it will tend to make the several subjects more clear.

"The catchword of the moment is 'Psychology'". . . . A catchword which has been the topic of seven books written by William James, the scientist. A catchword that is the name of a course of study found in every large university in the country. A catchword that is the subject of a text book at the U. S. Military Academy and to which Rear-Admiral L. H. Chandler devoted several pages in his thesis on "Principles of Command."

"Any one can define it for you." Yes any one can but probably the definition found in Funk and Wagnall's new Standard dictionary will suffice—"Psychology"—the science of the human mind or soul and its activities and capacities; the science that treats inductively of the phenomena of human consciousness, and of the nature and relation of the subject of them; mental philosophy.

"In application, however, it is as indefinite as 'Management' used to be." Indefinite in application and yet Columbia University is using it to select its scholars. Indefinite in application and we find several of the large business organizations employing it in the selection and distribution of their working forces. Indefinite in application and still it is used every day to weed out the mentally deficient from the public schools of several cities and it was used in the army, during the war, to select men who were to be classed as officer material.

"There is no need to 'introduce psychology in the navy.'" Perhaps we are far ahead of the army in this subject but all of the examples cited are to be found in that service and yet only last year a book by Lieut. Colonel Lincoln C. Andrews on the subject of psychology was introduced into the course of the U. S. Military Academy. In his thesis Admiral Chandler refers to seven subdivisions of psychology, any one of which is itself worthy of being introduced into the navy. No one of which has ever been fully appreciated by the navy.

"When trouble develops with personnel it will be found that it is nine times out of ten the result of psychology misapplied by some one." This

is one of the most convincing arguments that could possibly be advanced for the introduction of psychology into the service. Certainly the introduction will not increase the number of mistakes to ten out of ten; very probably it will reduce the number by at least one.

Then follows a long list of applications of psychology by great historical figures such as Drake and Farragut. Perchance if every naval officer were a Drake or a Farragut there might be no need of introducing psychology. However, such is not the case and so we must resort to some method that will assist us in emulating these men to some small degree. Psychology will.

U. S. NAVAL INSTITUTE
SECRETARY'S NOTES

Membership Life, regular and associate, 5452. New members, 27. Resignations, 9. Dropped, 1. Deaths, 1: Lieut. C. W. Johnson, U. S. Navy.

Practically the whole service receives the benefit of the PROCEEDINGS yet many officers, who read it monthly, are not members and therefore contribute nothing to the support of the Institute. Members are requested to urge non-members to join. Publication costs are now so high that the Institute is carrying a large monthly loss. The cost, per member, however, decreases with an increase in membership.

The annual dues (\$3.00) for the year 1921 are now **Dues** payable.

Regular and associate members of the U. S. Naval Institute are subjected to the payment of the annual dues until the date of the receipt of their resignation.

Discussion of articles published in the PROCEEDINGS is cordially invited. Discussions accepted for publication are paid at one-half the rate for original articles, or about \$2.25 a page. **Discussions**

All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS are to be sent, and thus insure their receipt. **Address of**

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The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers. **Book Department**

The Boat Book, 1920, and the Landing Force and Small Arms Instructions, 1920, are now ready for issue. The price of the former is 50 cents per copy, and of the latter \$1.00 per copy.

In the early part of the summer, the Institute will publish three books, bearing the following titles: "The Aircraft Hand Book," by Lieut. Albert Tucker (C. C.), U. S. Navy; "How to Preserve Your Boiler," by Capt. E. P. Jessop, U. S. Navy, and "Composition for Naval Officers," by Professors Stevens and Alden, Dept. of English, U. S. Naval Academy.

The prices of these books will be announced later.

The attention of readers of the PROCEEDINGS is invited to the classified analytical index for numbers 101 to 200 inclusive, which is noticed under "Publications." This is a most complete index, which has been prepared at considerable expense in order to make readily available the information contained in both the articles and the notes of these issues. Only a limited number of copies are being printed.

The Institute desires articles of interest to all branches of the service, including the Reserve Force. Attention is invited to the fact that the submission of articles is not limited to members, and that authors receive due compensation for articles accepted for publication.

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Whole Nos. 6, 7, 10, 13, 14, 15, 17, 144, 146, 147, 173, **Notice** 215 and 217 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, Md., May, 1921.

INFORMATION INDEX

	PAGE
ADVERTISEMENTS, INDEX TO.....	1
PUBLICATIONS, U. S. NAVAL INSTITUTE.....	(2)
SPECIAL NOTICE	989
TOPICS FOR ESSAYS	990

U. S. NAVAL INSTITUTE PROCEEDINGS NO. 218

LEADERSHIP OF MEN

By CAPTAIN F. B. UPHAM, U. S. Navy

CORRECTION

On page 490 of PROCEEDINGS No. 218, the words quoted should appear in quotations:

. . . . "a capable mariner. He should be that of course, but also a great deal more. He should be as well a gentleman of liberal education, refined manners, punctilious courtesy, and the nicest sense of personal honor."

PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER H. W. UNDERWOOD, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.	}	France	923
NAVAL POLICY.		Great Britain	926
MATÉRIEL.		Japan	939
PERSONNEL.		United States.....	944
MERCHANT MARINE.			
AERONAUTICS			948
ENGINEERING			953
ORDNANCE			958
RADIO			966
CURRENT NAVAL AND PROFESSIONAL PAPERS			967

FRANCE

NAVAL NEEDS OF FRANCE.—Paris Senators have been just as emphatic as *Messieur les députés* were in their affirmation of the need of a strong navy, worthy of France's glorious traditions on the sea and of her world-wide colonial empire. Under stress of financial pressure, the 1921 *Budget de la Marine*, which the Chamber had reduced by 300 million francs, has been further shorn of 130 million francs, coming down to barely 800 million francs, partly wasted on the upkeep of 35,000 Bolshevik arsenal workmen employed in non-naval work. At first sight, this might appear to be a move in the wrong direction: "*Pas d'argent, pas de marine*"; but it was more than made up for by a fine display of good intentions and of naval eloquence. Since the war, owing mostly to the financial ruin (national debt of 300 milliard francs), brought about by the systematic devastations of the infamous Boche (who will turn out to be the true winner of the war) and by the failure of the Paris politicians of verbiage to enforce the long-overdue reparations, French naval construction has been at a standstill (for the armed cargo vessels of the *Tahure* class are not *bona-fide* warships). Even the pre-war 900-ton *Enseigne Gabolde* has not yet been completed, in marked contrast with the activity prevailing in other navies; and so, naval eloquence and ever-changing programs of grand things to be done to-morrow have been the main productions of the *Rue Royale* Admiralty, under the patriotic, but powerless, Ministers Leygues and Landry. Indeed, if verbal and literary energy were an asset of naval worth, the *Marine Républicaine* would be greater than the *Marine Royale* ever was under the silent Colbert and the hard-working Sartines and Castries. No wonder Senator Béranger, *Rapporteur du Budget de la Marine*, waxed somewhat sarcastic about the prevailing habit of showering "*couronnes de fleurs et encens*" on French naval men, and proclaimed it was time to pass from empty words to manly action that alone counts in the balance. Considering the present plight of the Gallic Navy, and the deep discouragement among officers, he asked for a "*programme de renaissance et de resurrection*," not to change with the whims of every new minister, but

to be first discussed by Parliament and then to be carried out with the utmost speed.

The debate on the naval policy is to take place very shortly. After six years of stagnation, and in the light of the strides being made in rival navies, both parliamentary and naval men are agreed as to the need of an immediate effort with a view to restoring the fast-declining naval prestige of the Republic. The security of the coasts of France against landing and bombardment, and the safety of the maritime routes between France and North Africa, have been again and again mentioned as being the limit, for the present, of France's naval ambitions. Modest enough in appearance, extremely costly in practice, since aerial and ballistic superiority, together with a high degree of submarine and mining efficiency, are nowadays required to ensure the complete protection of coasts. The day is past of short-range warfare when coast defence could be organized on economical lines. To efficiently defend the coasts means that the whole problem of sea warfare must be satisfactorily solved; otherwise only make-believe results can be arrived at. Similarly, the securing of safe communications in the Mediterranean means that French naval and aerial supremacy in those waters must be so great as to discourage aggression. It must be uncontested. Such is not the case at present. Italy officially claims the supremacy, and with some reason; the cruiser fleet and the flotillas of the Peninsula have a distinct advantage in the matter of quality, and her aeronautical branch is well to the fore. Having suffered less from the war than France, she has been able to devote more attention to her naval armaments and to forge ahead. When is remembered the detrimental influence two isolated Boche cruisers without base near at hand exercised over the movements of the *Lapeyrère armée navale* and of Algerian troopships, it requires no great imagination to guess what would happen in the case of a war with a power enjoying the use of the many offensive bases of Sicily, Sardinia, and of Northern Italy. It is here that bold tactics of offence appear as the only practical safe and paying course, and ability to inflict greatest damage in the least time is the best insurance against war. No wonder Admiralty experts are giving special attention to the revolutionary changes in Mediterranean strategy brought about by war developments.

The recent move of the British Admiralty in the matter of new construction is considered here an object lesson to France, whilst the decision of BocheLand to start anew making her future on the sea, and without any ado, at the moment when she is proclaiming herself too poor to comply with the clauses of the Treaty she has signed, is justly held to be an insult to France and a challenge to Great Britain.

The Guisthau program, that is certain to be approved by Parliament, marks a considerable advance over previous projects of construction as regards both quality and number, and it will have the effect of vastly improving the naval position of France a few months hence. It will comprise six cruisers of 8000 tons and 34 knots, that will closely resemble the British *Hawkins*, excel the U. S. *Omaha* class, and totally outmatch Mediterranean scouts; 12 super-destroyers of 2200 tons, 36 knots, and 5.5-inch armament, to excel most, if not all, destroyers afloat; 12 *torpilleurs d'escadre* of 1000 tons and 35 knots of the improved *Gabolde* type; 36 submersibles of 600 and 1300 tons, very carefully studied with a view to robustness and reliability, and to be constructed at a rapid rate by state arsenals and private yards, an arrangement calculated to promote emulation and good work.

Preparations are being made to commence, this year, 3 cruisers, 6 super-destroyers, 12 *torpilleurs*, and 12 submersibles of the most powerful type. Moreover, the 190-meter ex-battleship *Béarn* is to be completed as a *porteavions*, despite the criticisms Admiral Guopratte made in the Chamber as to her lack of speed. When launched at La Seyne in 1918 she was built up to the main armor deck, and only weighed 5000 tons.

Since then her sides have been partly completed, and she received a temporary superstructure for the purpose of aviation experiments that were conducted under the supervision of Admiral Violette, and proved satisfactory. She is to be ready by 1923, and her transformation, with a speed of at least 23 knots and a very strong anti-submarine defence, is to entail an expenditure of some 60 million francs, whereas four years and over 100 million francs would be necessary to construct a 35-knot seaplane carrier on American lines. The Guisthau program will cost over one milliard francs, for it is probable that the cruiser and destroyer units to be laid down in 1922-3 will be larger than the 1921 type, superior quality over all comers being the desideratum of French naval men.

The coast defence organization is to be revised on up-to-date lines. British war exploits against Boche bases on the Belgian coast have shown it would be a mistake to entirely rely on aerial and submarine "defensive-offensive." Seaplane flotillas are extremely fragile and vulnerable, as recent experiments in the Channel and Mediterranean have shown; and and there is a limit to the number of submarines. Well-sheltered and posted gun batteries, thoroughly trained from peace time on realistic lines, afford the most reliable protection for naval bases and important strategic points. The comprehensive tests now proceeding at Gâvres with new explosives and new types of shells have made it clear that (for special reasons) 13.4 and even 12-inch guns on commanding positions on shore can be relied upon to outrange the most powerful superdreadnoughts afloat, whilst quick-firing 5.5-, 6.5-, and 7.6-inch weapons can render quite a wide zone unhealthy for destroyers and submarines, especially with the strides being made towards a solution of the night-firing problem.

Senator Tissier, who acted as the "*bras droit*" of ex-Minister Pelletan, criticized the presence in Paris "*notre plus grand port de guerre*" of too many officers *de vaisseau*, *paperasserie* making instead of actively preparing for war, which is their sole *raison d'être*. Some time since an old admiral denounced in *La Revue Hebdomadaire* the land-lubber inclinations of too many young gentlemen in blue, and, of course, the reduced number of ships in commission tends to turn too many of our 2300 *officiers de marine* into bureaucrats. A good weeding out will strengthen the fighting spirit of the service. Happily, the great bulk of the *Marine Française* is composed of true seamen, who are never more happy than when at sea. Senator Tissier urged the adoption of an official "*doctrine navale*" framed in accordance with the lessons of the war, and he meant on *la jeune Ecole* lines. It is doubtful if this is at all desirable; it is a mere catch-word, seeing that the naval science is ceaselessly changing, and even now is being changed as the result of post-war ballistic and aerial developments.

Great satisfaction has been caused by the appointment as chief constructor (in place of M. Maurice) of Ingénieur-Général Doyère, the creator of the *Normandie* quadruple-turret type of battleship, who is the most original and talented battleship designer the *Marine Française* has seen since the days of M. de Bussy (1889-91), creator of the *Dupuy de Lôme* and *Baudin* types. In the matter of scientific education and of theoretical attainments French *ingénieurs* have probably no rivals, but the strong point of M. Doyère, who at one time acted as chief constructor of the Chinese Navy, is a wide and solid practical experience, together with a go-ahead and inventive turn of mind. He thus possesses the qualities of those *grands ingénieurs du passé* who made French naval architecture first in the world. The able Hubac, who designed the fleet of Colbert, had previously studied in England and Holland; Forfait (1752-1807), rival of Sané, had done likewise. Chief Constructors Boucher (1825-1830), creator of the famous *Surveillante* frigate type; Dupuy de Lôme, who revolutionized naval architecture, and his worthy disciple, de Bussy, all proceeded on practical experimental lines with the avowed ambition of excelling for quality France's then only rival, the great British Navy.—*The Naval and Military Record*, Apr. 20, 1921.

GREAT BRITAIN

THE NAVY ESTIMATES AND THE CAPITAL SHIP.—The outstanding feature of the navy estimates, presented to Parliament during March, is the decision of the British Government to continue the building of large capital ships. The wisdom of such a policy has been much criticized in certain quarters; but in view of the considered opinion of the British naval staff as expressed a year ago that the necessity for the capital ship had survived the test of the war and still formed the unit on which sea power was built up—an opinion since endorsed and acted upon by the United States and Japan—it cannot, we think, be gainsaid that the British Government has come to a wise decision in the matter, especially as such a decision was not made until the matter had again been examined by a special committee set up for that purpose. As we have already stated, the question is one which only experts with a full knowledge of the facts of the war can decide, and must in the nature of things involve a compromise of conflicting factors based upon the probabilities of the case. Undoubtedly there has been a tendency by some to overstate the dangers of attack by aircraft and submarines.

In introducing the Navy Estimates in the House of Commons, Sir James Craig, Financial Secretary to the Admiralty, stated that it was intended to build four new vessels to replace the four oldest capital ships now on the effective list. The new ships would be an improvement on the *Hood* class embodying the lessons of the war. The keels would all be laid during the next twelve months, but it had not yet been decided where the ships were to be built, and it would be impossible to make much, if any, progress with the new ships until late in the autumn. A sum of two and one-half millions has been included in the Estimates as a first instalment for these vessels.

As regards other new construction, it is proposed to build a submarine and a mine-layer, both of which will embody the latest developments in these types of craft, and will also include a number of experimental features.

The object of the government's naval policy, as mentioned by the First Lord of the Admiralty in a statement explanatory of the Estimates, is to maintain a "One-Power Standard," *i. e.*, that the British Navy should not be inferior in strength to that of any other power, and, in his own words:

"The Government neither commits itself to, nor contemplates, any building 'programmes' in answer to those of any other Power. Indeed, it trusts that it may be possible, as a result of frank and friendly discussion with the principal naval powers, to avoid anything approaching to competitive building, either now or in the future."—*The Shipbuilder*, April, 1921.

FLOTILLA LEADERS.—A description, with photographs, is given in this article, of the various types of flotilla leader built for the British Navy from their inception in the *Marksman* and *Lightfoot*, 1913-14 program, to the *Shakespeare* and *Scott* classes, completed 1917-19. Details of armament, speed, power, machinery, etc., are given in the article. In passing, it is mentioned that for all-round fighting and sea-going qualities, the later boats are probably the finest boats extant. Their armament consists of five 4.7-inch and one 3-inch A. A. guns, and two sets triple 21-inch torpedo tubes. The nominal speed is 36 knots at light load on 40,000 s. h. p., but on trial speeds of 37.7 to 38.7 knots were attained. (*Marine Engineer and Naval Architect*, Feb., 1921.)—*The Technical Review*, Apr. 26, 1921.

NEW SUBMARINES.—So much attention was created by the announcement that the Government had decided to begin the construction of four new capital ships, to replace four vessels which had become obsolescent, that hardly anyone seems to have noticed the fact that it is also intended to build two other vessels of fighting types, a submarine and a minelayer.

It is true that no indication of this was given in the First Lord's explanatory statement, but in introducing the Estimates in the House of Commons Sir James Craig said: "We also propose to build a submarine and a minelayer, both of which will embody the latest developments in these craft, and will also include a number of experimental features." There is likely to be an even greater interest shown later on in the design and progress of these two vessels than in that of the capital ships. The latter, we know, will be improvements on the *Hood*; they will not be very much bigger, since it has been indicated that any dock which will take the *Hood* will take them also; and they are to embody the lessons, especially in regard to armament and protection, learned during the late war. But no similar hints have been given about the two smaller craft, particulars of which will thus be the more keenly awaited.

The outcome of the war was to confirm British naval designers in their plans, so far as big ships were concerned. The *Hood* thus affords a sound basis on which to prepare the designs of the new vessels, modified, of course, by battle experience and the studies of the past two years. But when the end of the war came, submarine construction was in no such settled state. We had in hand some small vessels of the 12-knot *H* type; others of the huge steam-driven *K* class, built for ocean-going work in company with the Grand Fleet, and still the largest and fastest submarines in the world; others, again, of the *L* type, designed for 17½ knots, and embodying the best results of earlier oil-engined vessels; and, lastly, a series of three submarine monitors of the *M* class, mounting a 12-inch gun apiece. It seems evident that the installation of steam machinery in the *K* type was a war time expedient which will not be repeated, but it will be no easy task to obtain from internal-combustion machinery a speed approaching the 24 knots which this remarkable though complicated type attained on the surface. The Admiralty Engineering Laboratory at West Drayton, for which increased financial provision is made this year, is largely concerned with researches and experiments in heavy fast-running marine oil engines, and it may be hoped that as a result of the work here it will be possible to instal in the new submarine engines of greater power than any yet adopted. To the submarine cruiser which Rear-Admiral S. S. Hall has advocated, of about 3000 tons with a sea endurance of 50,000 miles and six months, is probably a far cry. It will be interesting to see how near the new vessel approaches to it.

If there is no clear indication of the design of the new submarine to be gathered from past practice, still less is there any hint in regard to the minelayer. It appears that no ship has ever been built specially for this duty. We began the war by using obsolete cruisers for the purpose, and when these were found too slow, various kinds of other craft, such as destroyers, were utilized. Later on it was found desirable to equip submarines to lay mines, and the advantages of under-water craft in this connection would seem to be so great that there are many people who will expect to see the new minelayer with submersible powers. The only minelayer now on the active list, the *Princess Margaret*, has been very costly. Originally a 5000-ton liner, chartered and converted during the war, she was purchased in 1919, and in the coming year is to have £76,000 spent upon her for repairs and alterations. Though not exceptionally fast, she can carry a much larger supply of mines than regular war types can without interfering with their ordinary duties.—*The Army and Navy Gazette*, Apr. 16, 1921.

THE NAVY AND THE CRISIS.—Without touching upon the outcome of the negotiations between the coal owners and miners which, at the moment of going to press, are in progress, it is only right that a word of congratulation should be given to the Admiralty for the completeness and efficiency of their preparations to aid the civil power in case of an extension of the strike. The nation instinctively looks to the sailor in a time of trouble,

and once again its faith in him has been justified. There was a ready response to the order for the mobilization of the Royal Fleet Reserve, but long before the men of this force had begun to assemble at their ports the ships of the Atlantic Fleet had left for their emergency stations all round the coast. The presence of the battleship *Valiant* in the Mersey must by now be considered a hardy annual. She was there, we believe, during the railroad strike of 1919 and the coal strike of 1920, and so it was again to Liverpool that she was sent from Devonport last week. Similarly, the *Warspite* went to the Clyde, the *Delhi* to Cardiff, the *Dunedin* to the Humber, the *Dauntless* to Avonmouth, and other vessels were distributed accordingly. The offers of service from officers were so numerous that the Admiralty on Saturday night found it necessary to acknowledge them publicly; since they could not all be replied to. As regards the men, the presence of blue uniforms at Chelsea Barracks, turning this artistic quarter of London into a miniature dockyard, came as a plain indication that the Admiralty were ready with skilled men to send to the power stations or other centers where they might be needed to help in keeping going the life of the community. Happily, by Saturday night the situation had become easier, and everyone who has any regard at all for the welfare of his country will be glad if the elaborate machinery prepared for the emergency, and of the existence of which such a good indication has been given, will have no need to function.—*The Army and Navy Gazette*, Apr. 16, 1921.

A NAVAL EXCHANGE.—During the war, when British and American warships were working together in many seas, and the comradeship between the two navies was intensified by the perils and hardships of active service jointly performed, someone suggested that this naval entente ought to be perpetuated when peace returned by a system of exchanging squadrons. The idea was that at certain periods a force of British battleships or cruisers should be attached to the American fleet for cruising or maneuver purposes, taking its orders from the American Commander-in-Chief; while an American squadron should be similarly incorporated in one of the British commands. We believe we are correct in stating that an informal proposal to this effect was made to Admiral Rodman by the King when His Majesty was visiting the American admiral on board his flagship, the *New York*. At that time a force of American dreadnoughts actually formed part of the Grand Fleet, under the orders of Admiral Beatty, and it must have seemed the most natural thing in the world that the co-operation which had been brought about by stress of war should be continued in after days for the purpose of preserving peace. Since that time the idea has been revived by various American organs, but nothing has been done officially to give it effect. That the fraternal spirit which prevailed in the war is still very much alive is evident from the reception accorded to Admiral Sir Lewis Bayly on his recent visit to the United States. There is no doubt that the British Admiralty would cordially respond to an invitation to send a cruiser squadron to sail for a time with the U. S. Atlantic or Pacific fleet, and if an American force could simultaneously join up with our Atlantic fleet it would be welcomed with enthusiasm. We recognize, however, that the initiative must come from the Cabinet, not from the navy, and Cabinets are notoriously reluctant to take any step, that savors of the unconventional. Meetings between heads of governments are difficult to arrange when three thousand miles of ocean separate them, but they can keep in touch with each other through accredited intermediaries, and if it be true that President Harding intends to send a diplomatic mission to this country to discuss the limitation of armaments and other subjects, our government should take the opportunity to submit a formal proposal for the exchange of naval squadrons. Such an arrangement would constitute an effective guarantee of peace on the great waters.—*The Naval and Military Record*, Apr. 6, 1921.

AN ANGLO-AMERICAN NAVAL AGREEMENT.—We do not know what steps, if any, have been taken by the government to give effect to the desire of an overwhelming majority of the British people to come to an understanding with the United States on the question of naval armaments. It takes two to make an agreement, and it is impossible as yet to say whether American public opinion as a whole desires such a compact as would rule out the danger of competitive naval shipbuilding between the two great English-speaking nations. There has unquestionably been a reaction from the Wilsonian policy of co-operation with European Powers in the settlement of European problems, and at the present moment American statesmanship seems to be guided by the principle of abstention from those "entangling alliances" against which Washington, in his valedictory address, solemnly warned his countrymen. No sensible person will blame the United States for wishing to keep out of the Serbonian bog of European politics. Down to the end of the 19th century we in this country did our best to keep politically aloof from the continent, and even to-day there are many here who would fervently welcome a return to the "splendid isolation" from which circumstances compelled us reluctantly to depart. Barely 20 miles of water separate England from the continent, yet that "silver streak" had been for hundreds of years the determining factor in our foreign policy. It is therefore easy to realize why the Americans should be loth to involve themselves in the affairs of a continent from which they are separated by 3000 miles of ocean.

The inspired statements issued at Washington last week in regard to the visit of M. Viviani have served to clear the atmosphere. President Harding has made it plain that his administration cannot contemplate anything in the nature of an alliance with France or any other power. It remains to be seen whether he considers a naval agreement with this country as coming within the category of those foreign commitments which he and—as we believe—the mass of the American people are determined to avoid. If negotiations to this end are to be undertaken at all, they will demand the utmost tact and delicacy. For, as we are learning to our cost, the problem of working out a standard of relative naval strength satisfactory to both parties is by no means so simple as it looks at first sight. The first point on which enlightenment is needed is whether the American government would be content with a navy of approximately the same strength as our own. If so, then the main obstacle to an agreement disappears at once, for the British government has already expressed, though the First Lord of the Admiralty, its readiness to accept naval equality *vis-à-vis* the United States. It appears, however, that the Washington authorities are disinclined to make a pronouncement on this point until they have satisfied themselves that the Anglo-Japanese alliance is entirely without naval significance so far as the United States is concerned. The anti-British elements have been playing this card for all it is worth, and their persistent propaganda has succeeded to the extent of creating doubt in the American mind as to the wisdom of accepting naval equality with Great Britain whilst the latter remains the ally of Japan.

We must not blame the American people for regarding as a possibility that which every Briton knows to be a chimera, namely, an Anglo-Japanese armed league against the United States. It has been dinned into their ears by the Hearst newspapers that the alliance contains "secret clauses" which are susceptible of such an interpretation. This lie ought to be nailed to the counter once and for all. In Japan the foreign minister has repudiated it in the most explicit terms, but our own government has so far contented itself with a semi-official *démenti* which does not and cannot carry the weight that would attach to a definite and unequivocal statement by the Prime Minister or Lord Curzon. Niceties of diplomatic etiquette are perhaps responsible for our government's silence, but in a matter of this vital importance punctilio might safely be disregarded for once. The Japanese alliance may still have its uses, but no rational person can doubt

that an Anglo-American naval agreement would be infinitely more desirable on all grounds. As we have said before, it would involve none of the difficulties which inevitably shipwrecked every pre-war attempt to bring about a *pari passu* reduction of Anglo-German sea armaments. To put the matter quite bluntly, we could not trust Germany, and it goes without saying that common trust is the only foundation for an agreement of this kind. In the case of the United States, however, we could depend upon her scrupulously to observe any standard which she might have accepted, and we think our own pledge would be honored with as little hesitation by her. There need be no splitting of hairs as to the exact fighting value of individual ships. A mutual assurance that neither country would seek to outbuild the other would suffice. We believe such an arrangement to be eminently practicable. It seems to us—as it seemed to Mr. Balfour five years ago, when the Great War was at its height—"that the lesson to be drawn from history by those who love peace, freedom, and security is not that Britain and America should be deprived, or should deprive themselves, of the maritime powers they now possess, but that, if possible, those powers should be organized in the interests of an ideal common to the two states, an ideal upon whose progressive realization the happiness and peace of the world must largely depend."—*The Naval and Military Record*, Apr. 13, 1921.

GERMAN AND BRITISH CHEMICAL INDUSTRIES AND THE WAR.—The intimate connection between German dye works and munition and poison gas has been so strongly urged during and after the war, in the chemical journals as well as in the general press, that it hardly required the publication of a White Book to draw renewed attention to the subject. The introduction to the report of the British mission appointed to visit chemical works, issued as an army paper this week, will, however, help to make the official standpoint clear, and it will also serve to reduce the problem to its actual dimensions.

The British mission, appointed to visit chemical factories in the German territory on the Rhine now occupied by the Allies, consisted of seven experts under the leadership of Brigadier-General H. Hartley; they were accompanied by delegates from America, Belgium, France and Italy, and spent two weeks in February, 1919, in the chief chemical works of the district. Some years before the war three of the largest chemical concerns, the Bayer Company of Elberfeld and Leverkusen, the Badische Anilin- und Soda-Fabrik, and the Aktien-Gesellschaft für Anilin, had combined in a group. A second group was then formed, comprising the firms of Meister, Lucius und Brüning, Casella, and Kalle. During the war the two groups amalgamated, and their Interessen-Gesellschaft I.G. was joined by the firms of Griesheim-Elektron, Weiler-ter-Meer, and others. Not all these chemical works were visited, as they were not all situated in the occupied zone; but the inspection was extended to some of the larger explosive works of the district, such as the Rheinisch-Westfälische Sprengstoff A.G. of Troisdorf, the Carbonit A.G. of Schlebusch, the Rheinische Dynamit fabrik, of Upladen. The procedure adopted was to study, in the first instance, the lay-out and pre-war capacity of the works and their utilization, especially as regards explosives and poison gases, and extension for war purposes, and then to inquire into the processes of manufacture. Valuable information was obtained, although most of the special departments were no longer in operation, and enquiries were not readily answered.

The factories inspected can hardly be considered, it is pointed out, as representative of the explosive industry of Germany, and arrangements for utilizing the dye works for war purposes do not appear to have been made before the war; the chemists had later to be recalled from the front. Only a very small proportion of the propellant explosives used came from the dye factories, and very little before 1916. Of the explosives, trinitrotoluene was the most important, picric acid and dinitro benzene coming next; as over here, ammonium nitrate (about 40 per cent) was mixed with the high

explosives. The German and British methods of manufacture were found to be very similar taken generally, but the blockade restricted the Germans heavily as to raw materials. The nitric acid was, in Great Britain, practically all made from saltpetre; over there ammonia had to be oxidized into nitric acid, and paper crêpe and glycol took the place of cotton and of glycerin. Glycol is ethylen alcohol; before the war it had served as a substitute for glycerin, which it resembles, being also a sweetish, rather sticky fluid, but only for certain pharmaceutical preparations. The use of these new raw materials and of plant originally designed for the other purposes necessitated various modifications, some of considerable difficulties, in the processes. On the whole the commissioners consider that the German methods were not superior, and in some respects inferior to the British practice, and that the high-level efficiencies of British factories were hardly reached.

The poison-gas manufacture was concentrated in the occupied zone, and the bulk of the poison-gas factories had previously been producing dyes and pharmaceutical products. Different stages of manufacture were allocated to different works, in many, but not in all, cases to the advantages of rapidity and efficiency. Thus, for instance, the famous mustard gas was made by the old three-stage process of Viktor Meyer, partly in Ludwigshafen and partly in Leverkusen, many miles further down the Rhine, whilst a rapid and more efficient one-stage process was quickly worked out at Cambridge when the nature of the gas had been recognized. The German output figures are certainly impressive; but they have been equalled over here. The key of the whole chemical war industry was the synthetic ammonia manufacture by the Haber process. That was started at Oppau in 1912, chiefly to obtain ammonia salts for fertilization. The daily ammonia production there was raised from 25 metric tons in 1914 to 250 tons in 1918; the Leuna works in the Merseburg Government district brought that production up to 650 tons in 1918. The daily production of nitric acid was increased threefold, to 719 tons, during the war; the chlorine manufacture rose from 37 tons to 63 tons per day. Chlorine and phosgene were first the chief poison gases; later the I.G. works supplied varied organic compounds, and for their manufacture the dye works certainly offered facilities which did not exist in this country.

As regards the military importance of the German chemical industry the report states: "Although no arrangements had been made to utilize the chemical works at the outbreak of hostilities, the works were rapidly converted to war purposes, thanks to their highly-trained personnel and the great technical resources of their peace organization. In the future every chemical factory must be regarded as a potential arsenal, and other nations cannot, therefore, submit to the domination of certain sections of chemical industry which Germany exercised before the war. . . . As it is clear that the military strength of a country depends to a large extent on the development of its chemical industries, it is necessary to review the present condition of these industries in Great Britain and Germany." The linking-up of the heavy chemical trade (acids and alkalis) in which England had always been leading, with the production of dyes and fine chemicals was one of the strong German features; another was scientific organization, in the office as well as in the laboratory and factory. English chemical industry had her triumphs, too, during the war, also under heavy difficulties, though of different kinds. If there are no synthetic ammonia works yet in this country, Claude claims to obtain much higher yields than Haber by working at very high pressures, and research is being pushed everywhere. "The rapid growth of British chemical industry during the war proves that it can successfully compete with Germany provided that reconstruction is undertaken on a sufficiently large scale." We do not wish, on this occasion, to add anything to these concluding words of the report. The problems affect the general national policy.—*Engineering*, Apr. 22, 1921.

THE CONDUCT OF A NAVAL BATTLE.—*A lecture delivered at the Royal Artillery Institution, by Commander R. F. Seymour, C.M.G., D.S.O., R.N.*—Of all the more important events in war a decisive naval battle is perhaps the most rare, but when it does occur I think it has a more profound effect upon the future course of events than almost any other incident. By "decisive" I mean a battle which is fought right out and brought to completion on the spot by the destruction of the larger portion of the enemy's fleet. Such battles were the defeat of the Spanish Armada and Trafalgar, but they are very rare; they occur perhaps not once in one hundred years. The more usual battle when fleets meet at sea are victories of the type of Lord Howe's victory of the 1st June and the Battle of Jutland. In those battles history eventually assigns the victory to one side, but at the time probably both belligerents claim the victory, and it is rather difficult for them to see at the moment exactly what the effect of the battle is going to be. Those are the types of battles which everybody ought to expect in naval warfare because they are the ones which most usually occur. I am afraid they are usually hailed by a chorus of attacks from the public of the day on the Commander-in-Chief—attacks made by people who may have only heard of such battles as the defeat of the Armada and Trafalgar and expect them to occur on every occasion. The reason for this I think is that few people outside our own service really understand the problems with which the admiral is confronted, or the main characteristics of a sea battle.

A battle at sea is I think what you term in military parlance an encounter battle, and under modern conditions is fought at extremely high speed with the fleets engaged over a very wide area; for instance the slowest vessels in these days would approach at any speed up to 40 knots and the fastest destroyers when they are counter-attacking, at a speed of anything up to 70 knots.

Surprise is a very difficult thing to effect at sea. It is almost impossible to conceal the movements and the intentions of the various units. Perhaps the two most important factors in a sea battle may be said to be *time* and *weather*. I think one of the most striking things from naval history is how often the greatest sea commanders have exercised the most extraordinary patience under various circumstances and then suddenly, they have appeared to have thrown prudence to the winds and have proceeded with almost feverish energy to attack without the further loss of a moment. I think that is to be explained by the fact that in a sea battle the psychological effect of the attack—the exactly right timing of the attack is almost of more importance than the actual material gain or loss resulting from it. If this was so in the old days of sailing ships how much more so must it be in these days of high speed and when the inventions of aircraft and submarines have been brought to the stage at which they are. An attack made a moment too soon may be a stroke in the air, and an attack made a moment too late may miss an opportunity which will probably not occur again for many months.

The weather, in spite of modern conditions, may be said to play an enormous part in the fortunes of a sea battle and it is almost as much a cause for thought and trouble to an admiral as the actions of the enemy himself. One is continually fighting against the elements whereas the enemy appears at very infrequent intervals. A change in the weather conditions makes an immense change in the problem with which the admiral is confronted, and although admittedly this change is the same for both sides, the speed with which the admiral grasps or anticipates it makes a very great deal of difference to the immediate situation.

Again, although in battle too much reliance should not be placed upon signals, for they are at any moment liable to be interfered with by the enemy, yet the Commander-in-Chief can, by his own personal movements—the movements of his flagship—by his own personal effort and will, very largely dominate or retrieve a situation in battle.

Another point, which perhaps is not always realized in connection with our problem, is that we are entirely free from anything to do with supply, transport and movements of troops, so that really our staff problem is extremely simple compared to yours. This allows the admiral to exercise a great deal of personal control over his fleet.

The problem presented to the Commander-in-Chief has been most lucidly stated by Nelson who said, "The business of an English Commander-in-Chief is first to bring the enemy's fleet to battle on the most advantageous terms to himself, and secondly to continue them there, without separating, until the business is decided." He goes on in this particular memorandum I am talking about which was issued shortly before Trafalgar, to explain that he first of all will try to get the initiative (and in those days it was done by getting the weather gauge), and then he will throw the whole of his force on an inferior portion of the enemy leaving the remainder in a position where they can take no immediate part in the battle; and thirdly, he will endeavor to pass through their line and engage them from the lee side so that they cannot get away when the battle is beginning to go against them.

In the following October, however, just before the battle he issued an addendum to his memorandum in which he says: "Thinking it almost impossible to bring a fleet of 40 sail of the line into a line of battle in variable winds, thick weather and other circumstances which must occur without such loss of time that the opportunity would probably be lost of bringing the enemy to battle in such a manner as to make the business decisive I have made up my mind," and here follows a modification of his previous instructions which I think might be summed up by saying that he makes up his mind that he will expose his ships during the initial contact to greater risk of damage from the enemy in order to defeat these two factors, time and weather, upon which he lays particular stress.

Of course there is a limit to the risks to which ships can be exposed on initial contact in order that a decisive advantage may be gained later on, and the enemy engaged and defeated in the time available. The fixing of this limit must always be the supreme test in the judgment of the admiral commanding-in-chief. Nelson had behind him the whole of the experience of the sailing ship period, and we have behind us the very short amount of experience since the advent of steam, and the introduction of the torpedo.

I think the above characteristics of a sea battle should be kept in the forefront of one's mind, if the problem is to be understood rightly. I think that the reason why the tactics of a naval battle are very frequently controversial and misunderstood is that these characteristics are not fully grasped. To sum them up: a naval battle is an encounter battle fought at high speed over a large area, the element of surprise is small, time and weather are enormously important and a very large degree of control can be exercised by the commander-in-chief, who does not require a staff or anything like the scale required for a land battle.

I will now sketch our system of fighting instructions and they may be divided into two, those issued by the Admiralty, and those issued by individual commanders-in-chief. The Admiralty issues instructions dealing with the general principles on which a battle is fought and the commander-in-chief issues his standing instructions as to the different tactics he will pursue under different circumstances in the different dispositions of his fleet according to what force is placed under his command. The Admiralty system was one which was evolved over 100 years ago by Howe and Kempenfeldt whose fighting instructions, tactical movements, and all the signals ordering these movements and conveying the admiral's possible intentions, were compressed into one volume, the "Signal Book," and this signal book formed the basis of tactical training for the whole navy.

For the navy of the 19th century was one of peace, and as always happens in periods of prolonged peace administrative and technical details

crept in until the tactical and fighting part became almost submerged in a mass of administration and in the minds of many officers no doubt it was relegated to second place. However, for the last ten years before the war a tremendous effort was made and the fighting instructions were separated and taken out of the signal books. The books themselves were revised but, unfortunately, when war broke out those new books were never actually brought into force, and during the war the instructions on which we acted and on which we fought, on the few occasions when we did fight, were the Grand Fleet battle instructions which were tactical orders built up by the commander-in-chief of the Grand Fleet and which really combined the general principles which used to be issued by the Admiralty and the commander-in-chief's own detailed plans and instructions. They were separated from the signal book and the disadvantage was that the signal book issued by the Admiralty and the instructions issued by the commander-in-chief were not perfectly co-ordinated.

With the dispersion of the fleet at the close of the war we have now reverted to a system of Admiralty instructions dealing with general principles which will form a basis for tactical training of the fleet throughout the service and the commanders-in-chief issue their own particular fighting instructions and plans for the forces under their command. These are separate to the signal books but better staff organization ensures better co-ordination of signals and instructions.

I will now endeavor to give a short outline of how a modern sea battle might be, or probably would be conducted, and for convenience I will divide it into three portions, first the approach, which covers the time from when the advanced forces make contact until the main fleets sight one another. This is the period of reconnaissance when the advance forces have to discover and report the dispositions of the whole of the enemy's fleet and prevent the enemy's advance forces from discovering and reporting the dispositions of our own fleet. The second period is the main fleet action and the third period, is "after action" when the result has been achieved.

The fleet when at sea cruises in what is termed a cruising disposition, and these cruising dispositions are diagrams which are made out under various circumstances of cruising. This particular one here is a diagram showing the whole of the Grand Fleet concentrated and in cruising disposition. We have the advanced line of light cruisers disposed about five miles apart and about 35 miles ahead of the battle fleet. This is disposed in units of two or three ships. They are shown in this diagram as in line ahead, but in actual practice they are in a much looser formation; they really are spread almost in one continuous line as a look-out screen for the battle fleet. Positions 10 miles further ahead are provided for airships or aircraft, and for an air screen at visibility distance ahead of the light cruiser screen. Immediately astern of the centre of the screen at the point "U" we have the aircraft carriers. These carried the reconnaissance air screen; they kept an air screen out head of the light cruiser screen and on the enemy being reported it was the function of those aircraft carriers to despatch further aircraft to look out for and discover the enemy. These positions O, M, J, are the positions of the cruiser supports; two very fast specially built cruisers at O and M whilst J was the place where the battle cruisers were stationed with their accompanying destroyers. The function of the supports was to move up to repel any of the enemy's cruisers who pierced our screen, and the function of the light cruisers was to go on and to endeavor to outflank the enemy's screen and to locate and report the enemy's battle fleet. The advanced light cruiser line, their supports, and attendant aircraft carriers comprised the battle cruiser force. They were not always in station with the Grand fleet as shown; they were very often employed scouting at considerable distances. Astern of the battle cruisers is the reserve screen; any vessel of the enemy which succeeded in piercing or evading the battle cruiser force still has to meet this reserve screen of light cruisers. Two submarine flotillas usually accompanied the fleet; they were vessels of the K class (of which one has just been sunk)

group. These enemy reports, when sent off by wireless by these ships are received by all commanders of units and individual ships, the wireless organization providing for this, and they are plotted on a board. This plot is not only a matter of placing on the board the position of all enemy craft reported. The plot to be of value has to show the relative position as regards the opposing fleets at any moment. To achieve this the track of both fleets must be plotted continuously, our own fleet according to the reckoning and the enemy from all available data obtainable from all cruisers and from aircraft or from shore directional stations, or any other source. Shore wireless stations listened for any wireless signal made by the enemy and took bearings of it and passed out the result. Also certain ships in the fleet were fitted with directional wireless and they could get a fairly accurate fix of the position of the enemy.

One of the factors governing the cruising disposition used to be that every unit had to be within sight of its next outer ship or unit because when we went to the sea it was of the utmost importance that we should not touch a wireless key or send any wireless signal before the enemy were encountered. The whole of the maneuvering of the fleet when cruising had to be done by visual signalling and it was a fairly large order to turn the fleet in a short space of time.

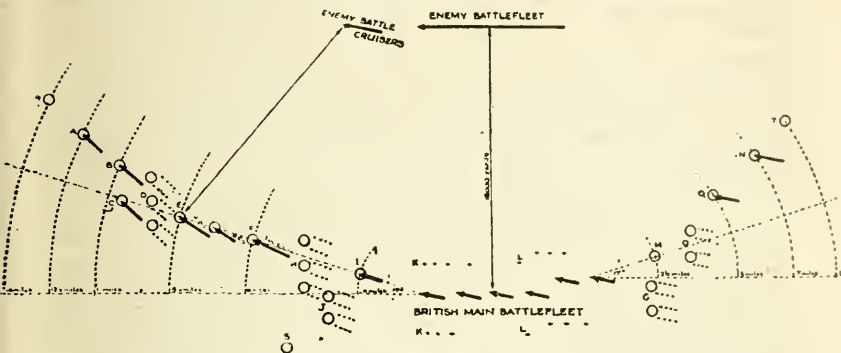
An accurate and continuous knowledge of the relative positions of the two opposing forces of course was of the utmost importance to the commander-in-chief, for on it depended the disposition of his fleet so that he could maneuver to a position of advantage just before the main fleets sighted one another. This moment was perhaps the most important of all because any error in the reports might lead the admiral to make a wrong disposition which might make him meet the enemy at a tactical disadvantage.

The moment of making contact between the main fleets is the moment when the work of the advance force's tactical reconnaissance ceases and ends that first part of the problem stated by Nelson to be "To bring the enemy fleet to action on terms as advantageous as possible." The Grand Fleet Battle Instructions laid down that to achieve this first part of the problem it would be the endeavor of the commander-in-chief first to place his fleet between the enemy and his base and secondly to dispose the guides of the battle fleet at right angles to the bearing of the center of the enemy.

At the end of the tactical reconnaissance or approach it was to be the endeavor of all ships to deploy as shown in this deployment diagram. The broad thick arrows show the divisions of battleships deployed with their guides at right angles to the bearing of the center of the enemy. The various units, which were the advance force, endeavored to take up their stations as arranged, always keeping contact with the enemy as they come in and ready to join in the fleet action at the moment when the two main fleets come into contact with one another. The battle cruisers in battle were to engage the enemy's battle cruisers and to prevent them from interfering in any manner with the attack of our torpedo craft. The function of the light cruiser squadron is first of all to prevent the enemy's destroyers, which are not shown on the diagram, from interfering with, or making their attack on our own battle fleet and also to clear the way for our destroyers to make their torpedo attack on the enemy. Directly the main fleets made contact those destroyers moved out in succession preceded by these light cruiser squadrons which you will see stationed right ahead of them. The unit of attack for destroyer flotillas is that they move out by flotillas but their actual handling is by half flotillas. The first half flotilla's function is to deal with any of the enemy's destroyers with which the light cruiser squadrons have failed to deal, while the second half makes its attack with torpedoes. At the same time if they do not meet with opposition both the light cruisers and the first half flotilla fire their torpedoes at the enemy as soon as they get in a position to do so.

The ideal position for everybody to attain is of course in the van. That is the position from which they can most conveniently attack the enemy's battle fleet but we have to station a certain proportion of vessels astern

DIAGRAM SHOWING THE ORDER OF THE FLEET AFTER DEPLOYMENT.



DETAILS OF THE DISPOSITION OF THE VARIOUS UNITS.

- A*, 1st Cruiser Squadron.
- B*, 6th Light Cruiser Squadron.
- C*, 3d Light Cruiser Squadron.
- D*, 13th Flotilla.
- E*, Battle Cruisers.
- F*, 4th Light Cruiser Squadron.
- H*, 15th Flotilla. Screening flotilla from leading battle squadron.
- J*, *K*, *L*, *G*, Alternative positions for screening flotilla from center battle squadron.
- I*, *M*, Alternative positions for 5th and 6th battle squadrons.
- O*, Screening flotilla from rear battle squadron. Alternative position for flotilla.
- Q*, 2d Light Cruiser Squadron.
- N*, 1st Light Cruiser Squadron.
- R*, *S*, *T*, Alternative positions for Harwich Force.

NOTE.—(1) It is not intended that the position shown in this diagram should be rigidly adhered to. The diagram is a guide only to squadrons and flotillas taking up their positions on deployment.

To avoid congestion at the van the distances shown for the leading battle squadron should generally be regarded as a minimum.

The direction in which the main action will be fought may differ from that of the initial direction of the deployment, and it may therefore be desirable to order detached units to take up their battle stations with a view to the strength being mainly in the van on the course the commander-in-chief considers will be that on which the action will eventually be fought, although the first deployment may be in the opposite direction.

Battle cruisers, 4th Light Cruiser Squadron and destroyers may therefore be ordered to take up their battle-stations on the port or starboard flank of the original line of advance of the fleet. They are to remain on this flank, unless special orders to the contrary are received even though the initial direction of deployment may be towards the opposite flank. The light cruiser squadron on the advanced line during the approach will remain on their respective flanks, two squadrons being at the van and two at the rear of the fleet for all directions of deployment.

of the fleet because the enemy may at any moment reverse his course and endeavor to escape, and if we reversed our course to meet his movement we should then find ourselves in a position of inferiority in the van. The Germans as a matter of fact stationed most of their destroyers on the disengaged side of their battle fleet and used to attack through the line, but I think on the whole our system of placing our destroyers at each end of the line had a greater advantage because it considerably hampers the movements of their fleet to have flotillas trying to pass through comparatively small gaps. The method which the admiral adopts to control this number of vessels in battle is one of considerable difficulty. I think it may be said that the methods of fighting adopted in various ages have alternated between the rigid system and the go-as-you-please system. The Elizabethans used to fight practically without any ordered system at all and everybody used to go for the enemy as he could. When the Dutch came along we had a more rigid system which gradually became a stereotyped single line in which we practically never got a decisive victory. It is obvious that the disadvantage of the rigid system is that subordinates tend to attach greater importance to preserving their station and to receiving the commander-in-chief's signals than they do to inflicting damage on the enemy, and ultimately failure may result from lack of initiative and the inability to secure a favorable opportunity when it arises. Of course the disadvantage of too much freedom is lack of co-operation. So we had to devise some system between the two and the system adopted in the Grand fleet in the war was that each unit was handled separately by its flag officer. Units were a division of battleships consisting of from four to five battleships, a squadron of light cruisers of anything between four and eight—there are generally about six—a flotilla of destroyers numbering about 20 and a flotilla of submarines about six to eight. The system adopted was that units were handled independently as occasion dictated and commanders had full power to initiate the movement of their units, conforming generally to the movements of the commander-in-chief. The commander-in-chief who was stationed in the center of the battle fleet controlled simply the division in which his flagship was stationed, but notwithstanding that decentralization of command he retained the power to order the movement of the whole fleet by executive signal, should he consider that it was necessary to ensure decisive results; for instance, supposing he had been successful in placing his fleet between the enemy and his base, and the enemy endeavored to escape by putting down a smoke screen, reversing his course and escaping under the stern of our fleet, it would then be necessary, for the commander-in-chief to reverse the course of his fleet to prevent him doing so.

The distribution of gun fire of the fleet was a matter in which considerable difficulty was experienced. It was found in the war that even if the commander-in-chief managed to maneuver so as to get into a position of tactical advantage it was extremely difficult for the gunnery people to reap the benefits of that tactical advantage because they were unable to select the right target and to concentrate their fire effectively. So a system was evolved whereby the commander-in-chief signalled the bearing of his flagship's target, and according to pre-arranged principles and the situation of the enemy which the commanders of each unit visualized from the plot, each unit could calculate the sector in which their targets lay and this provided them with the necessary information to obtain the desired concentration.

We are now able effectively to concentrate four ships on one, whereas at the beginning of the war it is very doubtful whether the fire of two ships on one was very much more effective than single ship to single ship. Now I think you can say that the fire of two ships is certainly twice as effective as one, and probably the fire of four ships is very nearly four times as effective as the fire of one ship.

With regard to torpedo attack, each unit of the fleet endeavors to effect a torpedo concentration on that portion of the enemy which is most suitably

placed to receive torpedo attack. Of course the difficulty of effecting a concentration of torpedo fire is the very long time of flight; whereas the projectile from a gun at a given range is perhaps a matter of 15 seconds, the time of flight of a torpedo is as many minutes—they take a quarter of an hour to 20 minutes to reach the enemy's battle line so that anything in the nature of concentration is very much more difficult with torpedoes.

We now come to the second portion of Nelson's statement of the problem, namely that of keeping the enemy engaged without separating until the business is decided. In the sailing ship era, which lasted hundreds of years, a solution was only found towards the end of it, and then more or less by accident, by Rodney breaking the line. Nelson always completed the business and once he got hold of the enemy he never let them go. The era of steam has not yet produced a solution which has been tested in battle. Of course there are a great number which have been produced on paper but all of them expose the fleet to an initial tactical disadvantage. Of course how much your ships should be exposed to this initial tactical disadvantage is the test of the judgment of the admiral. It was decided in the Grand Fleet after Jutland that in the event of the enemy trying to escape the torpedo disadvantage must be accepted and he must be kept under gun fire. We put our money on the gun; the enemy put his money on the torpedo.

Another possible solution is to divide your fleet and place one-half of your fleet on this side of the enemy and the other half on the other side but, of course, the difficulties of that are very great. One part of your force may be overwhelmed before the other force comes into action. Another possible solution is to get to such close range that it does not matter which way the enemy turns, but, of course, the difficulty is to get there when the enemy can easily keep you at long range by putting his helm over, and sheering off. It is extremely difficult to close with the enemy if he does this as each time he turns away time is lost in turning to follow him.

After the main fleet action has taken place there is very little more except that we had an organization for reorganizing all ships which still retained their tactical speed and had sufficient ammunition and torpedoes to take up the pursuit relentlessly. As soon as the enemy's order was broken and he was defeated it was the organization for ships to re-form, and without loss of time to pursue and, in the words of the instructions, it was the duty of all ships to "locate and report" and to "attack and destroy" the disorganized fleet.—*The Journal of the Royal Artillery*, April, 1921.

JAPAN

TURCO-JAPANESE RELATIONS.—A new departure for Japan is the appointment of a high commissioner at Constantinople in the person of Mr. Sadatsuchi Uchida, formerly Japan's minister at Stockholm, and the fact that his mission is not a temporary one decides the semi-official Paris *Temps* to infer that it is Japan's intention to fix an embassy at Constantinople as soon as peace is officially established between Turkey and the Allies. Then the high commissioner will become ambassador, and this well-informed Paris daily avers that those who know the prudence and the tenacity of Japanese diplomacy do not for an instant think that he will be a mere figurehead. He will be not only an observer in this capital of the Near East, where Japan has never before had any diplomatic representative, but he will be a pioneer, because Japan desires to conclude a commercial treaty with Turkey, and we read:

"He will pursue a certain policy, of course, because Japan is interested in the independence of Turkey and naturally has no pretensions to Turkish territory. Altho we do not know the circumstances in which the Japanese government decided to send a representative to follow the course we have outlined, we may well consider that Japan did not take action without having notified her ally, England. Moreover, Japan wishes to keep an eye

on Russia, where the Soviet government is taking up the tradition of the czars, and looking longingly toward Constantinople.

"By installing a diplomatic envoy in the capital of the Sultan, and by appearing to the Turks as the defender of their independence, Japan reminds everybody that with its 77,000,000 of population, with its army intact and its constantly growing fleet, it is the greatest power of Asia. Unless we are in error, it is pursuing the policy that has already led it to conclude an agreement with the Emir of Afghanistan. What is more, the Treaty of Sèvres provided that Japan would have a delegate on the Straits Commission, empowered with two votes, even as England, France, and Italy. It will be recalled also that the United States was to have two votes on this commission 'from the time it wished to participate, in case it should wish to participate'; and that the same treatment was promised Russia 'if it became, and on the day it became, a member of the League of Nations.' Turkey, like Greece, Roumania, and Bulgaria, was to have only one vote."

The arrival of the Japanese High Commissioner may prove to be a real advantage for Turkey, in the view of *Le Temps*, which admits that the independence and the future frontiers of the Sultan's state depend not so much on diplomatic conversations at Constantinople as on the shot and shell exchanged between the Nationalist Army of Angora and the army of King Constantine. But if the Greeks are finally vanquished, it is predicted that diplomatic arrangements will be helpful to the Turks toward a complete exploitation of their victory.—*The Literary Digest*, May 7, 1921.

DISARMAMENT IMPETUS IN JAPAN.—The cry for disarmament is beginning to penetrate "even Japan," it is noted by those who are impressed with the continuous reference to the subject in various Japanese newspapers of importance. Even some politicians have taken it up, although at the loss of a certain amount of their popularity, we are told. *The Japan Magazine* (Tokyo) is sufficiently moved by the views of Marquis Shigenobu Okuma, as set down in the Japanese *Taikwan*, to condense them for the benefit of readers of English, and it emphasizes the fact that this distinguished elder statesman is "not prepared to favor unconditional disarmament so heartily as other advocates seem to do, but bases his hope that Japan will adopt this policy upon the supposition that England and America will lead the way, as the two nations most vitally concerned." Before the war there were eight great powers, the Marquis Okuma reminds us, and three of them were naval powers—England, Germany, and America. Germany, Austria, and Russia are now in "a desperate or at least struggling position," and the two great naval nations are England and America. If the world sincerely desires peace let the strongest nations make the first move, the Marquis suggests, for if the weaker nations were to initiate such a movement it would be "tantamount to unconditional surrender," and he continues:

"To be sure the weaker nation can use its armaments only as a threat, but being so weak it can not disregard armaments altogether. The nation which has greater defences cannot demand that the weaker nation disarm first. If the strong have no aggressive designs, they do not need so powerful a fleet for defence merely. That Japan and Italy have no aggressive designs is proved by the weakness of their respective fleets. To be sure, Japan's 8-8 program may sound big, but compared with England and America, it is not even one-half as large. Hence, Japan has only the minimum, and can not begin to reduce. By all means let England and America begin. That will be the one short method of securing world-peace, and Japan will delightedly welcome such an arrangement.

"No one can deny the fact that the world is spending immense sums on armaments and is feeling severe financial embarrassment on account of this enormous expenditure. At a time when the nations are suffering serious financial depression after a war extending through nearly five consecutive years, and when provision for the national defence can hardly be made even with the utmost effort, how does Japan feel about this

matter? We are, indeed, not strong either financially or economically, yet we cannot neglect our national defences even for a day, since we are as dependent upon these for existence as a bird upon beak and spurs or an animal upon teeth and claws. . . .

"If the great powers could mutually agree to reduce their armies and navies it would, indeed, be a blessed thing for Japan as well as for this war-weary world. Merely from the financial relief alone, Japan would sing for joy. And, in closing I would repeat once more that, as the usual order of procedure is for aggression to come from the stronger upon the weaker, we are looking for America and England to set our hearts at ease by taking the initiative in disarmament and giving a good example to the world in this regard. As the first gleam of light I look to see England and America negotiate this question successfully, after which I trust France, Japan, and Italy will follow suit."—*The Literary Digest*, May 7, 1921.

IS THE ANGLO-JAPANESE PACT DEAD?—If it is not dead, the Anglo-Japanese Alliance is moribund, say some sharp Japanese critics, and ought to be allowed to die in peace. But altho the former reasons for it have ceased to exist, we hear from some British sources, new ones have come up that make a Far-East understanding between Britain and Japan of high importance, especially because of certain pro-American possibilities in China. Among the Japanese press the Tokyo *Kokumini* says that "if the object is to preserve the Anglo-Japanese Alliance as a historic monument or something like an object of art in view of the services it has rendered in the past, we have no objection," and it adds:

"Under the Alliance Great Britain fulfilled her obligation in the Russo-Japanese War, while Japan's obligation was discharged in the world war. Unless Japan assumes the duty of protecting India and Great Britain undertakes the task of guaranteeing the Pacific, there is no value in the Anglo-Japanese Alliance."

In the view of *The Herald of Asia* the first obvious inconvenience ensuing from the renewal of the Alliance would be the suspicion created among Americans that it is "ultimately directed against them." The relations between Great Britain and the United States, we are told, are no longer as cordial as a few years ago. This journal does not believe that Anglo-American rivalry, however sharp it may become, and "it will undoubtedly become dangerously bitter," will ever precipitate an armed conflict between the two nations. In any case, however loudly the British Government may shout its friendship for America, the renewal of the Alliance with Japan is "bound to excite an unfortunate suspicion in America as to the real intentions of the signatory powers."

The Round Table (London), a quarterly review of the politics of the British Commonwealth, believes that the fundamental interests of the British Empire in the Far East to-day are the same as they were ten years ago, namely, peace and security for British territory, good relations with all Far-Eastern Powers, the open door for trade with China, and the establishment of a capable and progressive government in China itself. On the latter point *The Round Table* observes:

"In the first place, there must be a clear understanding between the British Empire and Japan that Japan really wishes to establish a stable and independent government in China and is willing to live up to the principle of the 'open door' for the trade and commerce of all nations within it. That Japan will always have a predominant position in China is certain. Her geographical position insures this, provided that her policy toward China is benevolent and not rapacious. Nobody grudges her a position of exceptional authority and influence in China, but other nations could not acquiesce in her claiming for herself any exclusive privileges, and still less in her attempting to establish any direct or indirect authority over Chinese affairs."

The second-condition necessary to the renewal of the Alliance, according to *The Round Table*, is that it should not lead to misunderstandings with other powers, and it is pointed out that:

"The real danger of renewal is that it may lead to a counter-balancing combination between China and the United States. Nothing could be worse for the future of the British Empire or Japan than that they should drift into a position in which they were placed in opposition to the United States and China. So long as both Great Britain and Japan loyally live up to the principles which originally underlay the Anglo-Japanese Alliance, and the Government of Japan sets its face resolutely against the policy represented by the twenty-one demands, there is nothing in the Alliance which is hostile either to the interests of the United States or of China. But the negotiation of an alliance between two powers which cannot fail to affect the interests and the future of its neighbors is bound to arouse suspicion, and possibly hostility, unless it is done with their knowledge and consent."—*The Literary Digest*, Apr. 16, 1921.

OUR YAP PROTEST AS SEEN IN JAPAN.—A conciliatory attitude toward the American protest about Japan's mandate for the island of Yap is observed in some sections of the Japanese press, but in others the fear is expressed that "whether Japan yields an inch America takes a yard," and a rallying-cry is heard that Japan "stand fast," especially as America has no right to protest about anything covered by the Versailles Treaty, since she has failed to ratify it. Meanwhile, it is understood, say Tokyo dispatches, that Japan is consulting with Great Britain and France on the subject; and France, we learn from Washington dispatches, favors the American principle of equality of rights in mandatory territories advanced in the Hughes note to the four great powers associated with the United States in the war. In Premier Briand's reply to the Hughes note he points out that since it was sent simultaneously to the governments of Great Britain, Italy, and Japan, "it cannot be answered until after an understanding has been reached between the governments of the four interested powers at the time of the next meeting of the Supreme Council of the Allies." Mr. Briand adds, however, that he would "inform Your Excellency at once that when this question comes before the Supreme Council the representatives of France will broach the examination thereof with the greatest desire to find a solution which will give every satisfaction to the United States." The Tokyo *Chugai Shogyo* declares sharply that "if America insists on the internationalization of Yap, she will lay herself open to the charge that her intention is to snatch the island from another country in order to possess herself of it," and it asks:

"Is such an attitude consistent with the idea of justice and humanity which has been so loudly preached by America? The mandates for the South Pacific islands were decided upon on May 7, 1919, at a conference of Great Britain, America, France, and Italy. At that time the decision was entirely approved by Mr. Wilson. Yet America now objects to Japan's occupation of the island in question. Not only is this attitude of America improper, but it is difficult to understand her real intentions."

This Japanese paper is subject to correction on this point, it is noted by some, as may be gathered from a statement in Premier Briand's communication to Secretary of State Hughes, in which we read:

"By a note dated February 18, after having noted that the decision of May 7, 1919, made no reservation concerning the mandate attributed to Japan over the islands of the northern Pacific, my department pointed out to your embassy that nevertheless President Wilson and Mr. Lansing had formulated in the course of a former meeting in the presence of the representative of Japan categorical reservations concerning the island of Yap, that Baron Makino had not objected, that the question raised by the representatives of the United States should be placed in discussion, and that consequently the Japanese Government was cognizant of the

American reservations. The note concluded that thus there were elements for a resumption of conversations between the United States and Japan which the Government of the [French] Republic would be happy to see result in a satisfactory conclusion."

The Tokyo *Yorodzu* says bluntly that America's "threat," that if Japan does not agree to American claims regarding Yap, America will not recognize the Japanese mandatory rule of the island, is "insolent," and it asserts that as America has not ratified the Versailles Treaty "she has consequently no right of veto over its stipulations." The Tokyo *Hochi* charges that America "aims at the internationalization of Yap," and with that objective protests against Japan having the mandate, and therefore tries to prevent the cables from being monopolized by Japan. As the will of America is "uncompromising, there should be no optimism regarding the future of the problem," yet:

"If the question involved is only one of the disposal of the cables, the settlement will be comparatively easy, as is the case with the Atlantic cables, but the fundamental object of America is to internationalize Yap. If this American claim should be entertained, there would be no use in Japan's acquiring a few cables. We cannot but hope that the government will go to the root of the matter and see to it that an adequate settlement is made."

In contrast to the foregoing, other journals such as the Tokyo *Jiji-shimpo*, the *Asahi*, and the *Yomiuri* counsel moderation and cable concessions within bounds, and the *Yominuri* considers that the United States is justified "at least in protesting concerning the mandate, which is in the interest of harmony with Japan," but "should Japan abandon the mandates, she should ask the United States to abandon the fortifying of Guam."—*The Literary Digest*, Apr. 30, 1921.

SHIPBUILDING IN JAPAN.—Some remarkable facts relating to the expansion of the Japanese shipbuilding industry since 1914 have recently been published. Seven years ago the number of yards in Japan which were able to build ships of more than 1000 tons was limited to four. By 1918 this number had risen to 45. From 1916 onward the output of tonnage rose by leaps and bounds in response to the demand created by the war. The total output for 1916 came to 185,000 tons as compared with a maximum of 40,000 tons before the war. In 1917 vessels aggregating 486,000 tons were put afloat, and in the following year no less than 721,000 tons were launched. Following the armistice a decline set in, but in spite of this the Japanese yards produced 675,000 tons in 1919. The slump made itself felt more severely last year, the total for which was only 456,000 tons. Owing to the world-wide depression in the shipping industry many Japanese establishments are finding it difficult to carry on, and unless conditions improve it is expected that the number of yards will have been reduced to 17 or 18 by the end of the year. Some relief has been afforded by the large naval program introduced last year. As the Japanese Naval Attaché pointed out to one of our representatives not long since, with so many of the native yards clamoring for work it is most unlikely that the government will consider the placing of naval contracts abroad, and the prospect of foreign shipbuilders enjoying any share of the work is therefore remote. Furthermore, it is understood that during the debates on the new navy budget the government virtually pledged itself not to go outside Japan for any material which could be fabricated by native industry. As Japan already possesses the distinction of spending a higher percentage of her revenue on armaments than any other nation, it is only natural that her people should desire to keep the money in their own country. According to Mr. Ozaki, a prominent member of the Diet, the current naval and military budgets will absorb no less than 32 per cent of the total revenue.—*The Naval and Military Record*, Mar. 30, 1921.

UNITED STATES
NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR
VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION,
AS REPORTED APRIL 30, 1921

Type, number and name		Contractor	Per cent of completion			
			May 1, 1921		Apr. 1, 1921	
			Total	On ship	Total	On ship
<i>Battleships (BB)</i>						
44	California	Mare Island Navy Yard.....	96.5	96.3	96.1	95.7
45	Colorado	New York S. B. Cpn.....	71.3	69.4	69.3	66.2
46	Maryland	Newport News S. B. & D. D. Co.	98.3	97.8	96.8	96.2
47	Washington	New York S. B. Cpn.....	63.1	56.3	61.2	54.3
48	West Virginia.....	Newport News S. B. & D. D. Co.	52.1	42.4	49.5	39.3
49	South Dakota.....	New York Navy Yard.....	29.1	21.1	26.7	18.1
50	Indiana.....	New York Navy Yard.....	25.8	17.8	23.1	14.8
51	Montana.....	Mare Island Navy Yard.....	22.1	13.2	18.	11.9
52	North Carolina.....	Norfolk Navy Yard.....	29.4	21.	27.4	19.8
53	Iowa.....	Newport News S. B. & D. D. Co.	19.3	15.4	16.1	12.6
*54	Massachusetts.....	Beth. S. B. Cpn. (Fore River)..	3.	.5	2.5	....
<i>Battle Cruisers (CC)</i>						
1	Lexington	Beth. S. B. Cpn. (Fore River)..	16.6	6.5	13.8	4.
2	Constellation	Newport News S. B. & D. D. Co.	9.3	6.3	7.9	4.8
3	Saratoga	New York S. B. Cpn.....	20.4	11.8	18.1	9.5
4	Ranger.....	Newport News S. B. & D. D. Co.	1.6	.7	1.2	.6
5	Constitution.....	Philadelphia Navy Yard.....	6.	2.9	4.3	2.
6	United States	Philadelphia Navy Yard.....	6.	2.9	4.3	2.
<i>Scout Cruisers (Light Cruisers CL)</i>						
4	Omaha.....	Todd D. D. & Const. Cpn.....	91.4	82.7	90.	81.8
5	Milwaukee.....	Todd D. D. & Const. Cpn.....	88.3	79.7	84.7	78.9
6	Cincinnati.....	Todd D. D. & Const. Cpn.....	80.6	68.9	80.6	65.4
7	Raleigh	Beth. S. B. Cpn. (Fore River)..	53.8	35.2	51.4	33.3
8	Detroit.....	Beth. S. B. Cpn. (Fore River)..	53.6	35.	51.2	33.1
9	Richmond	Wm. Cramp & Sons Co.....	64.	38.	62.	....
10	Concord	Wm. Cramp & Sons Co.....	62.	36.	60.	....
11	Trenton	Wm. Cramp & Sons Co.....	44.	22.	41.	....
12	Marblehead.....	Wm. Cramp & Sons Co.....	42.	20.	39.	....
13	Memphis.....	Wm. Cramp & Sons Co.....	35.	14.	32.	....
<i>Auxiliaries</i>						
Fuel Ship No. 18, Pecos.....		Boston Navy Yard (Oiler AO 6)	82.5	81.6	75.5	73.8
Ammunition Ship No. 2, Nitro (AE 2)		Puget Sound Navy Yard Com	m. 4/	1/21	99.9	99.8
Repair Ship No. 1, Medusa (AR 1)		Puget Sound Navy Yard.....	60.6	44.5	58.	40.3
Dest. Tender No. 3, Dobbin (AD 3)		Philadelphia Navy Yard.....	57.3	57.	52.3	52.
Dest. Tender No. 4, Whitney (AD 4)		Boston Navy Yard.....	21.	12.5	19.5	7.6
Sub. Tender No. 3, Holland (AS 3)		Puget Sound Navy Yard.....	16.8	1.4	14.	....
Aircraft Tender, Wright (AZ 1).....		Tietjen & Lang.....	70.	57.	....	....
<i>Patrol Vessels</i>						
Gunboat No. 22, Tulsa (PG 22).		Charleston Navy Yard.....	64.6	44.7	59.8	41.8

* Battleship No. 54—Keel laid 4/4/21.

In addition there are under construction 8 destroyers and 37 submarines. There were delivered during April, 1921, 7 destroyers. Authorized but not under construction or contract 12 destroyers, 1 transport and 7 submarines.

THE BATTLESHIP AND THE JUNK HEAP.—Our British cousins are between the devil and the deep blue sea over the question of scrapping their great battleships and preparing for future wars in the air or under the sea. Its lines of communication are so vital to the British Empire that the discussion of the merits and demerits of the battleship have naturally aroused much interest in England.

The heat of the discussion has been felt in America. Our Navy Department has become so much interested that high ranking naval officers have been called upon to testify before the Naval Committees of Congress, and the Naval General Board have made a report on the subject.

The meat of the argument seems to be this: Friends of the all-big-gun-ship maintain that it is still the backbone of the fleet, and that, while the battle line needs numerous auxiliaries to protect it—such as battle-cruisers, light cruisers, destroyers and aircraft—the gun is still the principal weapon in sea warfare. The enemies of the big ship claim that the battleship is doomed—that with the same amount of money spent on submarines, torpedo-planes and bombers, the inordinately expensive dreadnought will be driven from the seas.

In the discussion on the other side of the Atlantic all hands, including even the opponents of the battleship, are agreed that the capital ships of the Grand Fleet, notwithstanding the fact that they were many miles from Dover Straits, made possible an uninterrupted line of men and supplies to war-stricken France, in default of which there is no doubt that Germany would have won the war.

Ordinarily the armed forces of progressive powers profit by the lessons learned in past wars, and the main lessons from the Great World War seem to indicate plainly the gun as still the controlling factor as far as capital ships are concerned.

Thus, British capital ships destroyed, or badly damaged during the war were as follows:

(1) By gunfire in fleet action.....	3
(2) By torpedoes in fleet action.....	1
(3) By mine	5
(4) By submarines	5
(5) By internal explosion	2
(6) By torpedoes or bombs from aircraft.....	0

Now of the five ships that were victims of mines, two were lost at the Dardanelles where they were sent over the protest of the ranking naval officer at the British Admiralty, who knew it was contrary to a well-recognized principle of naval warfare that ships cannot be used against shore fortifications, nor can they be used in confined spaces where mine-laying submarines have an opportunity to "lay their eggs." The other three were lost early in the war, before the paravane was perfected. If, therefore, the lessons of the last war are taken to heart, the mine should play a smaller part against the big ships in the future.

Of the five capital ships sunk by submarines two were at the Dardanelles, confined, in a sense, to a small area, thus offering the slow submerged craft an opportunity to attack them. The other three battleships were torpedoed near Malta, in the English Channel, and near Gibraltar, respectively; it is not known whether they were screened by anti-submarine craft when torpedoed, but it is known that *no* capital ships, cruising in fleet with a proper fleet screen, were lost.

No remarks need be made concerning the two ships lost by internal explosion—the answer to that is a more stable, more carefully made powder.

Taking out the five battleships lost by mines, the five lost by submarines, and the two by internal explosion, on the ground that a more expert knowledge of naval warfare should prevent these losses in the future, it can be easily seen that the war lessons point to the gun as the main factor of sea power.

In any study of the question as to whether the big-gun ship is obsolete, attack on it from three planes must be considered: *i. e.*, surface attack, underwater attack and attack from the air.

1. *Surface Attack.*—Students of naval affairs will remember that with the advent of the modern torpedo boat in the nineties, the disappearance of the battleship was predicted. Progress answered, however, with the destroyer to drive off the torpedo-boat, and this was followed in turn by the fast cruiser to take care of the destroyer, and by the battle-cruiser to protect the van and the rear of the battle line from the cruiser. The normal fleet then settled down to battleships, battle-cruisers, light cruisers and destroyers, and the fleet that could throw the most metal and hit with it, was the one that could win.

2. *Underwater Attack.*—Next came the submarine which some prophets say will play the main rôle in control of the sea in the future. Now, looking again to the lessons learned in the war, not one capital ship in a properly screened fleet was damaged by a torpedo from a submarine during the whole course of the war. One attack was made on the British fleet by Wedigen, universally admitted to be the best man the Germans had at the time, but the submarine was rammed and sunk and the capital ships suffered no damage.

The submarine is merely a weapon of opportunity. If it happens to be ahead of a fleet, on its track, and is commanded by an iron-nerved skipper like Wedigen, then it may come within range and take its toll. If the sub is off the track of the fleet, however, its slow submerged speed, while running silently, will not permit it to gain attacking position. If the submarine speeds up, the listening devices in the fleet screen will hear and warn the fleet, and all that the big ships need to do is to avoid that locality. Meanwhile the probabilities are that the fleet screen will get the submarine.

3. *Attack from the Air.*—The other plane from which the dreadnought is to be destroyed is above water. Here the form of attack is to be by torpedoes or bombs launched from airplanes. This was never tried in the World War. It is reported that, recently, in England, a torpedo attack from airplane was made on a squadron of battleships. Five out of eight of the ships were hit with collapsible-head torpedoes. The fleet was at anchor and there was no battleship screen of destroyers firing at the planes which launched the torpedoes. The fleet was not underway so that individual ships would have a chance, by a touch of the helm, to avoid the torpedoes seen in the water, as was done at Jutland.

We must bear in mind that in an airplane attack on a fleet with torpedoes, there are several difficult conditions to be met: (1) The plane must be only a short distance from the water; if too high the tail of the torpedo, carrying the delicate Obry gear, will be smashed and the torpedo will not run true; (2) the plane must be pointed in the right direction to hit the target; (3) the plane must be at a certain definite angle to the water or the torpedo will go to the bottom; (4) the fighting planes from the fleet will be attacking the torpedo planes, and (5) *most important of all*, the secondary batteries of the fleet and improved destroyer anti-aircraft guns will be firing at the attacking airplanes all the time during which they are attempting to fulfill the exacting conditions noted above.

It may well be that progress in aircraft and submarine design will keep an enemy battle fleet further from one's own coast but, after all, in any except a European war, the sea power—which I hold to be the guns of the fleet—must be sent to the vital strategic area in order to bring its influence to bear in ending the war.

Now if the Briton is to control from the air, he must be able to send his airplane torpedoes to the vital sea area. In the present stage of development he must send them in ships, and all an enemy sea power needs to do is to find some means to destroy the airplane-carrying ships. That should be easy.

In the rapid development of all kinds of weapons of war the world has done wonders in the past half century. In this development every nation has been forced to meet type with type. If England is to be considered America's most probable enemy (which God forbid); if she goes heavily into construction of airplane carriers and relies solely on war in the air, then we must meet her, not only by some weapon to destroy her airplane carriers, but by war in the air. If some other nation holds fast to the battleship we must meet her by power on the surface. Again, if any nation, whose policies clash with ours, lays great stress on the submarine, Uncle Sam must be fully prepared to combat the submarine. This has been proved in the past when the torpedo-boat brought forth the design of the destroyer, and the armored cruiser was met by the faster, heavier gunned battle-cruiser.

One of the questions that form the main theme of the writing of the capital ship's principal enemy—Sir Percy Scott—is "What can the battleship do?" The answer comes from one of the underlying principles of sea power. The big gun ship places gun power, the controlling factor of naval strength, in the sea areas where needed. Big-gun superiority forms a point of support for cruisers and other warships and enables them to patrol and control the area in question.—*The Scientific American*, Apr. 16, 1921.

MERCHANT MARINE

SEAMAN GO ON STRIKE.—Owing to the refusal of the representatives of the marine labor organizations to permit any downward readjustment of wages at this time, union seamen on American ships were called out on strike at the beginning of this week when the agreements heretofore in force regarding working hours and rates of pay expired. At the time of this writing, it is impossible to judge how widely the strike order will be obeyed nor to what extent shipping under our flag will be tied up. Negotiations for a settlement are also still in progress which may lead to a speedy and satisfactory adjustment of the present differences.

This insistence of the seamen upon their former scale of wages is largely due to the attitude of the engineers, who have been the chief beneficiaries under the old overtime clause which enabled the seamen to draw considerable extra compensation. According to Admiral Benson, out of the \$72,000,000 paid to seamen during the past thirteen months no less than \$6,000,000 was due for overtime. Many engineers are reported to have swelled their earnings as much as one-third under this overtime provision, which has tempted them to postpone doing necessary work until such a time as they were no longer on regular watch. With the abolition of overtime, they face a reduction under the new scale of perhaps thirty per cent in their gross income. As the overtime clause has been abused in the past, ship operators are united in endorsing Admiral Benson's stand that payment for overtime services at sea should be for the most part eliminated.

As pointed out by our Washington correspondent, the Shipping Board only determined upon a 15 per cent cut in wages after its experts had ascertained that there had been a fall recently of from 18 to 30 per cent in the cost of living. The wage reduction which the men have been asked to accept cannot, therefore, be deemed unwarranted. In resisting a fair offer and in attempting to delay the inevitable readjustment of wages from war time levels the marine unions have forfeited public sympathy and are engaged in a losing contest. With the exception of the railways, wages in all the great industries of the country have been reduced in accordance with the lowered cost of living. It is no hardship for the laboring classes to accept less pay so long as their purchasing power undergoes no impairment. Workers in shipbuilding and ship repair plants have realized that wages could be reduced without their suffering hardships, and our seamen ought to come to a similar conclusion.—*The Nautical Gazette*, May 7, 1921.

AERONAUTICS

PRESIDENT HARDING AND AERONAUTICS.—Aviation is inseparable from either the army or the navy, and the government must, in the interests of national defense, encourage its development for military and civil purposes.

The encouragement of the civil development of aeronautics is especially desirable as relieving the government largely of the expense of development, and of maintenance of an industry, now almost entirely borne by the government through appropriations for the military, naval and postal air services. The air mail service is an important initial step in the direction of commercial aviation.

It has become a pressing duty of the Federal Government to provide for the regulation of air navigation; otherwise independent and conflicting legislation will be enacted by the various states which will hamper the development of aviation. The National Advisory Committee for Aeronautics, in a special report on this subject has recommended the establishment of a Bureau of Aeronautics in the Department of Commerce for the Federal regulation of air navigation, which recommendation ought to have legislative approval.

I recommend the enactment of legislation establishing a Bureau of Aeronautics in the Navy Department to centralize the control of naval activities in aeronautics, and removing the restrictions on the personnel detailed to aviation in the navy.

The army air service should be continued as a coordinate combatant branch of the army, and its existing organization utilized in cooperation with other agencies of the government in the establishment of national trans-continental airways and in cooperation with the states in the establishment of local airdromes and landing fields.—*Flying*, May, 1921.

THE NAVY SHOULD HAVE A BUREAU OF AERONAUTICS.—The activities of the Navy Department are carried on under a system of separate bureaus, each of which is confined to certain specific work. Thus, the Bureau of Construction and Repair designs the hulls of the ships; the Bureau of Steam Engineering designs the motive power; the Bureau of Ordnance designs the guns, and so forth; and each of these is in charge of a director, or chief, who directs and is responsible for the work done in his own particular bureau. This segregation of the multiplied activities of the navy has not been an arbitrary matter; rather, it represents a natural growth in which the institution of separate bureaus has been rendered necessary by the multiplication of inventions and discovery and the ever-increasing complexity of the modern warship. In fact, the bureau system finds its counterpart in that specialization which is such a marked feature of our modern industrial activity, where the growth of each particular branch of industry has been so rapid and has so greatly widened the field of knowledge, that it is all that one man can do to get a thorough mastery of one particular field.

The birth and rapid development of the new art of aeronautics and the important part which it is bound to play in future naval warfare have brought the Navy Department face to face with the question as to whether it must not now create another bureau to deal with what is already a highly specialized branch of naval activity. Even to-day, when we stand merely on the threshold of aeronautical development, the art is sufficiently developed to call for the services of a highly specialized class of men in the designing room, in the work shop, and in actual flying service with the fleet at sea. What we already possess in the way of machines, men and knowledge is merely a beginning, and it is certain that the call for a special bureau will become more insistent as the years pass by.

There is a powerful movement at work in favor of the institution of a United Air Service, in which the design and construction of machines and the training of officers will be done under a single central body, and the machines and the men allocated to the army or the navy in response to the

demand. Personally, we believe that the army service on land and naval service at sea are so widely different, both in the character of the machines required and in the training of the personnel, that no greater mistake could be made than to include the two branches in one central service.

In the first place a machine that is suitable for land service is not suitable for the sea. The conditions are widely different. Given a fairly level and smooth field, the army plane can take off and land upon it no matter in what part of the world the landing field be situated; but for sea service you must have a plane which can take off from or land upon the sea itself or upon the unstable platform of a ship which has been built especially for that purpose. Furthermore, not only must the naval aircraft be designed for these special conditions, but the flying man, to be thoroughly efficient, must have been bred to the sea. He must have acquired the sea instinct and initiative which is the mark of your efficient naval man and is every whit as essential to the officers and men who navigate in the air as to those who navigate upon the surface of the sea. The air squadrons of a great fleet must be trained to operate with that fleet and find their proper position in it just as completely as a battle-cruiser squadron, a cruiser squadron, or a flotilla of destroyers and submarines. They must know their commander-in-chief, be familiar with his tactics, and be on their toes all the time, ready almost to anticipate the orders which long familiarity and training have taught them to expect.

To put the flying activities of the navy under a separate outside organization such as the army or a United Air Service, would be as efficient as to have a United Bureau of Ordnance and have the navy constructor send the sketch plan of the proposed armament of the ships to such a body, with the request that they design the suitable guns, gun mounts, projectiles, ammunition hoists, and what not. Such a course would make for errors, misunderstandings and inefficiency.

Hitherto the development of naval aircraft has been everybody's task and the task of no one in particular. The immediate need of the navy is a responsible directing bureau in the navy which can care for naval aviation and foster its growth and development. Unless we have such a bureau, aviation will continue to stagger along and we shall be faced with a repetition of the failures which have been all too frequent in our submarine development.

The idea of coordination, as expressed in a United Air Service, is attractive as an abstract proposition. Great Britain thought so—tried it out—and has abandoned the idea as impracticable.—*The Scientific American*, Apr. 16, 1921.

SECRETARY DENBY OPPOSED TO UNIFIED AIR CONTROL.—Washington.—Secretary of the Navy Denby told the House Committee on Naval Affairs April 25 that he is absolutely opposed to a separate air service with unified control over army, navy, other governmental aviation and civilian flying.

The view of Mr. Denby was sought while he was urging the passage of legislation creating a Bureau of Aeronautics in the Navy Department, which President Harding recently recommended.

"A Bureau of Aeronautics in the Navy Department is necessary in the interest of aviation development," he said. "At present, aviation activities are scattered through perhaps a dozen bureaus. The plan is to bring all activities into one bureau."

The creation of such a bureau was recommended to President Harding by the National Advisory Committee for Aeronautics, which likewise urged the necessity for establishing a bureau of aeronautics in the Department of Commerce to take care of civil aviation, and went on record in opposition to separating aviation from the army or navy.

Secretary Denby urged the committee to be as liberal as possible in providing funds for the development of aviation in the navy.

"The people do not realize that our navy is lacking in one arm," he said. "Aviation has become a vital part of our naval forces. If our fleet should ever engage another force it should be just as fully equipped with planes and carriers as its opponent in order to be on an equal footing." He said a Bureau of Aeronautics would decrease expenses.—*The Aerial Age Weekly*, May 9, 1921.

AMERICAN AVIATION POLICY.—President Harding has submitted to Congress, with his approval, a report of the National Advisory Committee for Aeronautics, in which are recommended a naval air service, an army air service, and a bureau of aeronautics in the Department of Commerce to regulate air navigation and to encourage civil and commercial aviation. The President agrees with the army and navy officers who controlled the subcommittee making the report that a single air department for military, government and commercial purposes should not be created. On April 11 Chairman Kahn of the Military Affairs Committee introduced in the House of Representatives a bill providing for a single Bureau of Air "to make more effectual provision for the aerial defense of the United States and to provide for the concentration of national air strength." On the same day he introduced a bill "to regulate air navigation." The issue, then, of a single air department is before Congress.

In the report whose recommendations President Harding approves it is declared that "aviation is inseparable from the national defense," and that "it is of vital importance in time of peace to make the greatest possible progress in the science itself." And thereupon the committee proposes something that will impede "the greatest possible progress" in aviation; that is to say, it recommends a distribution of authority, initiative and responsibility among at least three agencies—the army, the navy and the Department of Commerce. "Neither the army nor the navy, nor both combined," says Brigadier General William Mitchell of the Army Air Service in his book, "Our Air Force, the Keystone of National Defense," "can be expected to develop, organize and perfect a flying corps and its employment to the greatest possible limit of which that weapon (the aeroplane) is capable." In his recent message to Congress President Harding said that "the civil development of aeronautics" must be encouraged to relieve the government "largely of the expense of development and of the maintenance of an industry now almost entirely borne by the government through appropriations for the military, naval and postal air services." The President might have added, what is of the first importance, that if progress in aeronautical invention is to be promoted, the government must have the co-operation and aid of the civilian or independent manufacturers. The prospect must be opened to them of selling their machines to companies engaged in freight and passenger traffic as well as to the government for the army, navy, and the Post Office and other departments.

How can the government encourage the civilian manufacturers aside from giving them contracts? By developing air routes and building aerodromes in all parts of the country, for use by commercial aviators as well as by the army, the navy and the post office. The committee headed by General C. T. Menoher and Admiral D. W. Taylor recognizes the necessity of this in its report when it recommends that the Army Air Service take up the work, with as much co-operation as it can get from other government agencies and from the states and municipalities. Indeed, the report to which President Harding gives his endorsement outlines a scheme of such magnitude that to submit it to several bodies for execution would be to court failure and to waste money. Concentration, and not distribution, is the key to success. Chairman Kahn's bills may need amendment, perhaps redrafting, but they point in the right direction. A nation that takes the lead in commercial aviation should have the best aerial offense and

defense. (*Editorial in New York Times.*)—*The Aerial Age Weekly*, May 2, 1921.

NEW FIGHT LOOMS OVER AIR POLICY.—The fight for an independent air service, waged for the past two years, has broken out afresh and with increased vigor since submittal of the report of the National Advisory Committee for Aeronautics on a Federal air program. In the controversy fanned by the report innuendoes are made that a report of a minority of the committee was withheld and President Harding deprived of part of the information he asked for.

All three civilian members of the National Advisory Committee, it is stated, signed the minority report. They are F. H. Russell, Glenn L. Martin and Sidney Waldon. Major W. G. Kilner is also stated to have signed the minority report.

This quartet in its minority report urged the President to direct the National Advisory Committee to consider and report on whether it is better to divide aeronautics among four departments, as is recommended in the majority report, or to establish a Department of the Air, a Unified Air Service or an Independent Air Force. They asked Dr. Charles D. Walcott, Chairman of the National Advisory Committee, to incorporate this suggestion with the majority report.

This was not done, and its omission is the ground for the charge that the President has been favored with only one side of the question. The majority report favors an Army Air Service, a Naval Air Service and an Air Mail Service conducted separately and independently as now, and a Bureau of Aeronautics in the Department of Commerce for regulation of air navigation. The National Advisory Committee on Aeronautics should be continued, the committee suggests, for scientific research in an advisory capacity for co-ordinating all federal aeronautical activities.

While the four constituting the minority of the committee are advocates of an independent air service, in which all air activities shall center, Dr. Walcott says they signed the majority report. Mr. Waldon says that the minority report, after omission from the account of the committee's findings delivered to the President, was sent to Mr. Harding. The showdown of strength between the advocates of the different policies will come in Congress, to which the majority report has been transmitted by the White House.—*The Aerial Age Weekly*, May 2, 1921.

A PROPOSED AMERICAN TRANSPORT AEROPLANE.—The machine illustrated and briefly described is to carry forty passengers with all their baggage, and contains several interesting constructional features that are not as radical as they may seem at first sight. The use of metal construction, variable pitch propellers and supercharging, are admitted to be the next steps in development. The problem of supplying sufficient power to drive a large aeroplane has brought out several different solutions. Owing to the limited power available in one unit, the majority of the giant aeroplanes built have been powered by a multiplicity of engines; in several machines as many as six have been used successfully. The two general types of construction are, a central power group and a distribution between the wings. The solution proposed here is the employment of very large power units placed very close together, but driving the propellers directly.

This new transport machine is a biplane, and is planned to carry forty passengers, a crew of four and about 2400 pounds of freight. It is constructed of steel and aluminium, thus reducing fire risk. It is equipped with two 1200-horsepower dual V-engines, designed especially for the purpose, driving 12-foot, 4-bladed variable pitch propellers, which are patented by the designer.

The principal dimensions are as follows:

Span	125 ft.
Chord	16.5 ft.
Gap	14 ft.
Height overall	19 ft.
Length overall	75 ft.
Total area	3864 sq. ft.
Petrol tank capacity	1200 gal.
Endurance	12 hr. at 100 m. p. h.
Maximum speed	130 m. p. h.
Power loading	15.4 lb. per h. p.
Wing loading	9.6 lb. per sq. ft.
Total weight	18.5 tons.

—(Flight, Jan. 20, 1921.)—*The Technical Review*, Apr. 26, 1921.

ALCOGAS AVIATION FUEL.—An account of test made with a fuel mixture consisting of 40 per cent alcohol, 35 per cent petrol, 17 per cent benzol and 8 per cent other ingredients, in comparison with aviation petrol.

The fuel tests were made on a Liberty engine, in respect to the maximum power attainable, and the fuel consumption with the weakest mixture giving maximum power; the speed range was from 1400 to 1800 r. p. m., and the altitude range (as simulated in the altitude laboratory) was from 0 to 25,000 ft. Compression ratios of 5.6 and 7.2 were employed. A description of the fuels, and their physical properties is given, with the distillation temperatures; the initial boiling points were practically the same at 60 degrees C., whilst the 90 per cent values for the alcogas and petrol were 145 degrees C. and 127 degrees C respectively. A description of the test plant used and the manner of conducting the tests is included. The results of the tests which are described at some length and are illustrated by a large number of graphs may be summarized as follows:

(1) At 5.6 compression, the same maximum power production at ground level and a general average of 4 per cent more power at altitude was obtained for the alcogas; the maximum difference of power was 6 per cent at 6400 ft. and 1800 r. p. m. in favor of the alcogas.

(2) At 7.2 compression, an average, and fairly uniform increase of 4 per cent in power at altitude was obtained in favor of the alcogas, no comparative figure being obtained for the petrol at ground level.

(3) The alcogas showed a fuel consumption per b. h. p. from 10 to 15 per cent greater than the petrol for this maximum power at any altitude, speed or compression ratio. Owing to the 12 per cent higher density of alcogas the fuel consumption in terms of volume per b. h. p. was practically the same in the two cases.

(4) The thermal efficiency of the alcogas was superior by about 15 per cent. A pound of alcogas contains about 22 per cent less heat units than a pound of petrol, so that in securing more power with 15 per cent greater fuel weight it is evident that the available energy of alcogas is more fully realized than in the case of petrol.

(5) With the 7.2 compression ratio, the alcogas develops about 15 per cent greater power for the same fuel weight per unit power.

(6) The radiator capacity required per brake horse-power is the same in the two cases.

The alcogas was observed to give smoother running than when the same engine was run upon aviation petrol, but no information was obtained relating to the effect of the fuel on the continued operation of the engine. (V. R. Gage, S. W. Sparrow and D. R. Harper, Report No. 89 U. S. Advisory Committee for Aeronautics, 1920. 9 pp., 27 figs.)—*The Technical Review*, Apr. 12, 1921.

TRIAL FLIGHTS AND ACCEPTANCE TESTS FOR NEW TYPES OF AEROPLANES.—A. G. Fokker.—The ideal test pilot is, or should be, the designer of the machine. Unfortunately, this combination is very rare, and the designer has usually to rely on reports of others as to the properties of his machine. Until reliable recording instruments are in our possession, the "personal element" will predominate in the tests and "scientific" pilots are not always available.

The following are the main characteristics which an aeroplane should possess, and on which the test pilot should concentrate his attention:

Getting Off.—The machine should possess sufficient directional stability while running along the ground. As soon as the flying speed is reached it should be able to get off without the use of the elevator.

In Flight.—There should be no hunting, either in the horizontal or the vertical direction. The changing over from "power-flight altitude" to "gliding-flight altitude" should be automatic and quick. Even at the lowest flying speeds wing-flap controls should be possible. When executing curves there must be no tendency to go into a nose dive or spin. When side-slipping the machine should still be controllable. All rudder organs should be properly balanced.

Landing.—Smooth landing depends very much on the type of landing wheels and their position. By proper construction, any tendency to leave the ground again can be checked. (*Het Vliegveld*, Jan. I, 1921.)—*Mechanical Engineering*, May, 1921.

ENGINEERING

TENDENCIES IN MARINE OIL ENGINE PRACTICE.—During the winter session now drawing to a close, there have been a number of notable technical papers read before the learned societies dealing with all branches of engineering, and where marine engineering is concerned perhaps the two most important have been "The Present Position of the Marine Diesel Oil Engine," by Mr. James Richardson, B.Sc., read before the Institution of Engineers and Shipbuilders in Scotland; and that on "Mechanical Gears of Double Reduction for Merchant Ships," by Mr. R. J. Walker, C. B. E. and Mr. S. S. Cook, B.A., before the Institution of Naval Architects. Selection of these papers is made for the reasons, firstly, that they deal with the two most modern developments in marine propulsive machinery, and, secondly, because we desire to draw attention to the trend of the discussions that ensued in both cases.

First, to deal with the oil engine question, as was perhaps inevitable, considerable attention was focussed on the relative merits of engines working on the four-stroke and the two-stroke cycles. Very definite statements were made in the paper on this subject, to the effect that most of the published data referring to power output obtained with two-cycle engines were incorrect, and these engines were credited with a power capacity that could not be sustained continuously at sea. This view was supported by reference to the submarine engine practice adopted in several important navies. Conditions in such service make imperative the reduction to a minimum of the space and weight of the main machinery, and it was noted in the paper that the four-cycle engine held a predominant position for satisfying these conditions.

On the theoretical side the author maintained that the limiting factor in respect of the power obtainable from any given size of combustion cylinder is the quantity of heat that can be passed through unit thickness of cast iron per unit of time for a given maximum temperature at the inner surface of the metal. The limit on this basis is largely independent of the piston speed. For instance, with a high mean effective pressure a low speed of revolution may give a reasonable figure of heat transfer through the metal surrounding the combustion zone, and conversely, a low mean effective pressure will permit safely of a high speed of revolution. In

support of this contention, it may be noted that two-cycle engines, which have a higher mean effective pressure than is general with four-cycle, are mostly designed to run at a lower speed of revolution. Naturally in making comparisons on a mean pressure basis the mean effective pressure is that for the whole cycle. In the case of the four-cycle engine the cycle extends over two revolutions or four strokes, whilst with the two-cycle engine there is an explosion every revolution, or every two strokes.

The limiting rate of heat transfer is, of course, dependent on the material in use. Certainly for convenience of machine work and for general reliability, it is reasonable to assume, for the present at any rate, that an ordinary grade of good hard grey cast iron will be adopted and the limiting temperature of the inner face of the casting must not be such as to cause serious disintegration of the metal through the graphite plates and consequent liability to cracks, etc. Practice, at any rate with large four-cycle engines, has now reached such a stage that standardization has almost set in, and practice at sea has served definitely to give a safe figure for this question of heat transfer. Assuming that the proportion of the heat of the fuel that has to be abstracted from the burning gases is more or less constant, and that the stroke-bore ratio can be assumed as fixed, so that the area of the piston is practically an exact fraction of the total area of the combustion chamber, then the limiting condition can be expressed as pounds of fuel per hour consumed per square inch of piston area.

Taking the total amount of fuel per hour consumed in any cylinder and dividing it by the piston area in square inches the quotient should not greatly exceed 0.2 pounds per square inch per hour. This is certainly, a conservative rating, referring primarily to large engines and it could no doubt be safely exceeded for small cylinders. Large marine four-cycle practice over a number of years of continuous operation at sea, however, amply confirms the desirability of being conservative in this respect, indeed it was noted in Mr. Richardson's paper that even with the progress in design made within the last few years there has been generally a measurable increase in the weight and the space occupied by the slow-speed marine Diesel engine per horsepower developed continuously. This is due largely to the reduction in the rate of heat transfer.

The mean effective pressure for two-cycle engines on a brake horsepower basis appears from the table of mercantile engines given by Mr. Richardson to average about 66 pounds per square inch. The highest figure quoted is 73.5 pounds and the lowest 55, but the author held that it was very doubtful if a mean pressure higher than 55 pounds per square inch on a brake horsepower basis could be continuously sustained at sea. Three examples of two-cycle marine engines cited gave mean effective pressures of 73, 66 and 73 pounds per square inch on a brake horsepower basis, and the rate of heat transfer was equivalent to a fuel consumption of 0.39, 0.315, 0.345 pounds per hour per square inch of piston area.

Corresponding to these figures certain stresses are developed in the material. On certain assumptions, it was concluded that the stresses arising from unequal expansion may in the three cases quoted amount respectively to 24,000, 14,900, and 15,000 pounds per square inch, the highest stress occurring in the largest engine. It is quite obvious that fractures in cast iron cannot be a matter of surprise when such stresses are imposed. As already mentioned the safe rate of heat transfer corresponds to a fuel consumption of 0.2 pound per square inch of piston area per hour. Hence, if the two-cycle engines be reduced in power output to the same basis the mean effective pressure will fall to a very moderate one of less than 55 pounds, and there will be, Mr. Richardson maintains, little, if any, gain in space or reduction in weight, as compared with the four-cycle engine.

To examine a little further this all important question which is raised in this paper, and so fully pursued in the discussion, it cannot, owing to lack of published definite data, be said to be conclusively proved that the rate

of heat transfer equivalent to the combustion of 0.2 pounds per hour per square inch of piston area is altogether established as the limit apart from the question of the quality of the fuel and the maintenance of the exhaust valves, matters which are not exactly common to engines of both cycles.

With a low grade of fuel oil, exhaust valve maintenance may be so onerous as to demand a reduction in power output with the four-cycled engine, apart from the heat transfer question proper. On the other hand, two-cycle cylinders with exhaust ports on one side and scavenging air inlet ports opposite, where cool air enters to clear out the hot gases, are certainly highly stressed, during full power running at a high rating, in this particular part of the cylinder, as it must be borne in mind that the necessarily high velocity of the issuing exhaust gases involves a high rate of transfer of heat to the cooled exhaust bars, and adjacent parts.

No doubt the quality of the metal surrounding the hot gases will be gradually improved. Much research to this end is now in progress, and in due course the results so obtained will be translated into foundry practice. To such metallurgical improvements, engine design and performance will quickly respond. The special point we wish to urge is the fact that no data giving definite information regarding the two-cycle engine were given in the paper or discussion although there was ample testimony to the satisfactory performance of four-cycle engines. If there are two-cycle ships operating at sea with good results and working at high mean effective pressures and heat transfer figures, it would be greatly to the benefit of progress in marine engineering that the facts should be widely known.

Coming to the second paper it is probable that no marine engineering paper of recent times can have been so eagerly looked forward to as that of Messrs. Walker and Cook on "Mechanical Gears of Double Reduction for Merchant Ships," as there have been so many rumors of failures of mechanical double reduction gearing. Little enlightenment on a number of factors, however, was given by this paper, other than a certain amount of very interesting information on the one subject of torsional shaft vibration. It is, however, cheering to have the statement given by Engineer-Admiral Sir George Goodwin that failure was much less frequent than it had been 12 months ago, but whether a lessening of the tooth pressure or the exercise of greater care in workmanship, or both are responsible was not elicited. In this paper the authors quoted that in Great Britain and other countries (excluding America) the number of ships with double reduction gears built and under construction is about 220 representing a total of 1,150,000 horsepower. As successful examples only three designs—five ships—are quoted having constants in the equation

for pinions over 10-inch diameter, viz., constant = $\frac{P}{\sqrt{d}}$ varying from 195

to 238. The statement that a constant between 180 and 220 is good practice, is made, although the authors hold that there is nothing to show that considerably higher loads than represented by the constants, could not be adopted. It is a well-known fact that a number of ships with double reduction gear are operating at sea at a fraction of pull power, and so with a very much smaller tooth pressure than that designed, as was well pointed out in the discussion by Captain Onyon, M. V. O., R. N. Are there any double reduction gears running at sea continuously with constants of 220 or higher? Again, the questions involved are of such importance as to demand a solution which can only be obtained by the recording and publishing of actual details of performance. If a high standard of workmanship, materials and lubricants are the critical factors, then it is necessary that standards of such accuracy should be formulated, and definite means for securing these be made general. We do not desire at present to deal in detail with this question. It is evident, however, from the two discourses which are the subject of this article that nothing but gain can accrue from a close co-operation between the engineer and the shipowner. What is desirable is a free expression of experience and a complete recording and

publication of full facts of performance. Along this path, and only by such means can these absorbing and highly important questions be raised from the present level of uncertainty and doubt to the realm of established experience.—*Engineering*, Apr. 8, 1921.

SIMPLEX DETECTOR SHOWS PRESENCE OF SALT IN BOILER FEED WATER.—

The presence of salt in boilers is universally admitted to be highly objectional because of the reduced steaming capacity which results from salt being deposited on the heating surfaces, and also because of the danger of overheating which is always present when there is salt on these surfaces. In the case of water-tube boilers, which are now being used more extensively than in previous years, and where even a small deposit of salt may have serious consequences, greater precautions are generally taken to keep the feed fresh than when the ordinary type of boiler is installed.

In this connection mention may be made of a most remarkable instrument manufactured by the McNab Company of Bridgeport, which has been named the Simplex Salt Detector. It is so designed as to indicate at all times the grains of salt in each gallon of feed water, thus revealing the presence of salt before the water enters the boiler, even though the quantity be as little as one grain per gallon. Furthermore, should the quantity of salt suddenly increase as the result of a split condenser tube, or of the evaporator priming, the apparatus gives immediate warning of the fact by ringing a bell, and by causing the electric lamp contained within the instrument to burn with increased intensity. This permits of the defect being remedied before the density of the water in the boiler has increased perceptibly.

The presence of salt in the feed water of marine boilers is ordinarily due to leaking condenser tubes and to evaporators priming. In the usual course the water is tested by a salinometer, but this test is dependent upon the human element, as it is taken as and when the engineer sees fit or finds it convenient to do so. The salinometer does not detect the amount of salt entering the boiler through the feed line, but merely determines the quantity of salt in the boiler. The Simplex Salt Detector, however, detects and gives warning of the presence of salt in the feed water before it enters the boiler.

The working of this instrument is based on the well-known fact that pure water has a high electrical resistance, which, however, falls very quickly if certain compounds—of which ordinary salt is one—are added to the water. The essential part of the apparatus is a glass vessel fitted with two electrodes by which a current is passed through a sample of the feed water, the necessary current being taken from any convenient direct current power or lighting circuit. The electrodes are made of a special grade of platinum iridio and are so arranged that no metal part of the connections is in contact with the water. This is important as it avoids the excessive corrosion which would otherwise take place. The electrodes are adjustable so that the sensitiveness of the instrument can be varied.

As mentioned above, the instrument gives a continuous indication of the saltiness of the feed, and this is done by having a small supply of feed water flowing through the glass vessel, entering at one end and flowing out at the opposite end. The resistance of water falls very rapidly for a small increase in the amount of salt present, and this tends to make the simplest arrangement too sensitive. To obviate this, in the Simplex system, a resistance is introduced which is in the form of an incandescent 105 volt carbon lamp contained within a brass dome on top of the instrument. The lamp shows no light when the water is fresh, but as soon as salt is present, will begin to glow a dull red, which gradually increases to full brightness as the salt increases. This enables the officer on watch to see at a glance whether there is salt in the feed, and if so, whether it is in sufficient quantity to require immediate attention.

A meter attached gives a quantitative indication of the amount of salt present in grains per gallon at 100 degrees Fahrenheit. A definite warning is given immediately the salt exceeds a fixed percentage, and is operated by a relay connected in series with the instrument. The relay is very easily adjusted.—*The Nautical Gazette*, Apr. 30, 1921.

ALUMINIUM AND ITS ALLOYS.—A report of three Cantor lectures delivered before the Royal Society of Arts, describing the properties of aluminium and its alloys and the lines of investigation leading to the production of alloys with varying properties particularly suited to diverse industrial uses. Aluminium is chiefly valued on account of its low specific gravity, but the strength of the pure metal is insufficient for many applications, and it is essential to alloy it with other metals to attain the necessary tenacity, this involving some sacrifice of the low specific gravity, except when magnesium is employed in combination, when the alloys are very easily corrodible. Another metal which may eventually prove to be a serious rival to aluminium is beryllium, otherwise known as glucinum, but this has not yet been developed commercially and its properties have not been fully investigated.

The industrial application of the alloys of aluminium is chiefly considered from the engineering aspect. At the present time their comparatively high cost restricts their use to cases where lightness is of considerable importance. The war gave a great incentive to their production and use for many purposes, but during peace, when conditions are much more competitive on a price basis, the extensive use of aluminium alloys in general engineering will be largely dependent on a reduction in the cost of aluminium. The compositions and specifications of various alloys developed for war purposes are given and the improvement in the quality of these alloys by ageing is noted. Prolonged annealing also effects the improvement, but is hardly considered to be of commercial application. In connection with the use of aluminium pistons in internal combustion engines, many investigations were made to determine which alloys exhibit the best tenacity at comparatively high temperatures, and a remarkable alloy is that containing 14 per cent of copper and 1 per cent of manganese which shows an increasing tenacity with increasing temperature up to 250° C. The alloy containing 4 per cent of copper, 2 per cent of nickel and 1½ per cent of magnesium, previously referred to, shows the highest tenacity of the whole series for all temperatures up to 310° C. The adoption of this alloy, will, it is considered, eliminate the occasional trouble experienced from burnt pistons. The use of aluminium alloy pistons has resulted in an increase of power of the order of 20 per cent being obtained from engines as compared with the use of iron or steel pistons. Piston slap and the growth of pistons is discussed, the latter effect being comparatively small and being capable of elimination by annealing. The question of securing the gudgeon pin in aluminium pistons and the possibility of the employment of the metal for bearing surfaces is considered in some detail. The use of aluminium for cylinder castings has not resulted in as many advantages as was anticipated, but in the case of air-cooled engines, the freedom from distortion owing to the high conductivity of aluminium is a marked advance. Aluminium cylinder heads can also be advantageously employed. The use of aluminium alloy connecting rods is a probable development. The construction of girder frameworks for rigid airships offered a wide field for aluminium alloys and it is considered that they will play an important part in the development of the all-metal aeroplane, the latest phases of this science being dealt with in detail. Considerable economy could be effected in railway work by the use of aluminium alloys in place of steel for the chassis of coaches, and in all applications where acceleration and retardation of masses is an important factor, while their use in bridge and roof construction would also effect great economies. (W. Rosenhain, D. Sc., F. R. S., *Journal of the Royal Society of Arts*, Nov. 5, 12, and 19, 1920.)—*The Technical Review*, Mar. 29, 1921.

ORDNANCE

NAVAL GUNNERY AND CONSTRUCTION.—The gunnery experiments which were carried out in the Channel early in February, and which resulted in the sinking of the ex-German battleship *Baden*, appear to have had a wider significance than was appreciated at the time. They were supposed to have been held mainly to determine the resistance of German armor and internal protection to the attack of heavy naval projectiles. No official account of the firing has been published, but we gather from unofficial reports that the bombardment was performed by the monitor *Lord Clive*, which had been temporarily armed with three heavy guns—of 15-inch or larger caliber—on a triple mounting, to which we shall revert later. The distance between firing ship and target was not great, but the guns were fired with reduced charges, which gave the projectiles a velocity equivalent to that which would remain to them at very long range. The fact that certain German ships of older design and less substantial protection had endured at the Battle of Jutland a tremendous amount of punishment without being sunk or absolutely disabled seemed to warrant the assumption that the *Baden* would survive a very severe hammering. This expectation was not fulfilled. So far as we are able to gather, her flotation, was destroyed long before the prescribed number of rounds had been fired, either because our projectiles were exceptionally destructive or because the armor and other defences of the ship were less robust than had been surmised. As originally planned, the tests, we believe, were to have included an attack by torpedo-carrying aircraft, though considering that the target was stationary, the practical value of the latter experiment cannot have been great. Even when allowance is made for the difficulty of obtaining a straight run from torpedoes which have been dropped into the sea from aircraft flying, perhaps, 50 feet above the surface at a speed of 70 to 90 miles an hour, it should not be hard to strike a motionless target with an overall length of nearly 500 feet. These torpedo attacks were duly delivered, but it is stated that the *Baden* had already been sunk by gunfire and was lying in shallow water, with a heavy list to starboard, when struck by the torpedoes. Our illustration shows the damaged ship lying partially submerged between Dean Tail and Dean Elbow buoys, between the mainland and the Isle of Wight. She has since been salvaged and patched up for further experiments.

In the absence of data as to the type of gun used in the attack, the number and character of the projectiles fired, their initial velocity, and the general conditions in which the firing took place, it would be futile to attempt any definite inferences from this most interesting gunnery experiment. Sir E. T. d'Eyncourt has stated, however, that the *Baden's* thickest armor failed under an attack which British-made plates of the same thickness would have resisted. It is certainly gratifying to have this authoritative tribute to the excellence of British armor. Sir Eustace d'Eyncourt's statement corroborates the remarks made by Sir Robert Hadfield at Sheffield last month, which we reproduced in our issue of April 1st. His claim was that at Jutland our armor withstood the attacks which it was designed to defeat, and kept out the German projectiles wherever its thickness warranted that expectation. He attributed the failure of the *Queen Mary's* 9-inch turret armor to the concentrated effect of two and probably three armor-piercing shell, a blow approximating to 48,000 foot-tons. On the other hand, as the photographs published in *The Engineer* of February 20, 1920, clearly showed, the 11-inch and 12-inch belt and barbettes armor of the German battle-cruisers was holed repeatedly by our projectiles. In the course of the tests made with the *Baden* last February her waterline belt, nearly 14 inches thick was penetrated time after time, although, as we have said, the velocity of the projectiles had been reduced to correspond with firing at considerable range.

To illustrate the formidable nature of the target attacked we may quote from Mr. S. V. Goodall's description of the *Baden's* armor and protective plating, given in his recent paper read before the Institution of Naval Architects. The main belt, he stated, is $13\frac{3}{4}$ inches thick, tapering to $6\frac{1}{2}$ inches at the lower edge; above this is a $9\frac{7}{8}$ -inch belt extending to the upper deck. This citadel is enclosed by athwartship armor bulkheads, and beyond them thinner side armor is fitted which terminates at armor bulkheads. Above the upper deck and set in about 5 feet from the deck edge is the $6\frac{1}{2}$ -inch armor of the secondary battery. The gap so formed is protected by $1\frac{3}{8}$ -inch deck plating. The deck above this battery is from $1\frac{3}{8}$ inches to $1\frac{1}{8}$ inches thick. The sloping protective deck—the middle deck amidships and aft—is $1\frac{3}{8}$ inches thick; abaft the citadel this deck is increased in thickness up to a maximum of $4\frac{3}{4}$ inches over the steering gear. Forward of the citadel the protective deck—the lower deck—is generally $2\frac{3}{8}$ inches thick. Barbette protection varies from $13\frac{3}{4}$ -inch armor above the top decks to 1-inch plating at the bases of A and B turrets, and $4\frac{1}{2}$ -inch armor at the bases of X and Y turrets. Gunhouse armor is $13\frac{3}{4}$ inches thick at the front, $9\frac{7}{8}$ inches at the sides, horizontal roof $3\frac{1}{2}$ inches thick, and sloping roof $4\frac{3}{4}$ -inch. The 5.9-inch casemates of the secondary battery are formed by transverse and longitudinal bulkheads of $\frac{7}{8}$ -inch plating. The fore conning tower has a maximum thickness of $13\frac{3}{4}$ inches with a $5\frac{7}{8}$ -inch roof, the corresponding thicknesses for the after conning tower being $7\frac{1}{8}$ inches and $5\frac{1}{4}$ inches, respectively. Above the protective deck the coal bunkers extend practically from A to Y barbettes, and when filled with coal reinforce the protection afforded by belt and decks. A further addition to this protection is provided by the $1\frac{3}{8}$ -inch splinter bulkhead, which is a continuation to the upper deck of the torpedo protection bulkhead. Armor gratings protecting the openings in the fore-castle and protective decks are of the built-up type formed by $\frac{1}{2}$ -inch bars. In some of the protective deck openings a second tier of gratings with bars fore and aft is fitted immediately below the upper tier. As regards protection against torpedoes, a longitudinal bulkhead 2 inches thick, terminating on $1\frac{3}{8}$ -inch transverse bulkheads, is fitted throughout the greater part of the length of the ship. Outside this are coal bunkers about 6 feet wide, and beyond these an air space 7 feet wide amidships and slightly less at the ends.

Whatever the shortcomings of our pre-Jutland armor-piercing projectiles may have been—and the defects attributed to them by Lord Jellicoe have been vigorously challenged by high authorities—there is not any doubt that the armor-piercing shells now used in the Royal Navy are of a most efficient type. The modifications introduced after Jutland concerned not merely the filling and the fuse, but a revision of the old proof requirements for armor-piercing shell bodies, which had become out of date. We have been assured by a leading artillery expert that the modified type of 13.5-inch armor-piercing shell now in use has great penetrating power at a given range than the 15-inch armor-piercing shell fired at Jutland, and is therefore the more destructive weapon of the two, notwithstanding that it weighs only 1400 pounds as against 1930 pounds. As the improvement extends to armor-piercing projectiles of all calibers, it goes without saying that the armament of our present-day battle fleet is incomparably more formidable than was the case a few years ago, though the ships remain the same. Before leaving this subject a word may be said about the German projectiles. It had been assumed that Germany had adopted very long shell for her heavy naval guns, but this opinion turns out to be incorrect, at least as regards the 15-inch gun. The pieces of this caliber in the *Baden* employed an armor-piercing shell 3.5 calibers long and a high-explosive shell 4.1 calibers long, the weight in both cases being 1653 pounds, of which the armor-piercing burster represented 519 pounds and the high-explosive burster 148 pounds. The German 15-inch projectile was thus nearly 300

pounds lighter than the British, and its length did not exceed that of the latter. On the other hand, the German 11-inch and 12-inch high-explosive shell had a length of approximately $4\frac{1}{2}$ calibers. The principle of using very long projectiles is not by any means of recent date, for as far back as 1871 we find Sir Joseph Whitworth writing as follows: "I desire to make all guns capable of firing powerful shells six diameters long, using the regular charge of powder. When high velocity is required, and for long ranges, then projectiles should be from three to four diameters long." It does not appear that shell of six diameters in length have ever been fired in actual warfare though the 12-inch high-explosive "portmanteaux," loaded with "Shimose," with which the Japanese attacked the Russian ships *Tsushima*, are said to have been over 5 feet long. They tumbled badly in flight, but despite this a remarkably high percentage of hits was made, and the heavy burster caused great havoc.

Gunnery practice against ship targets has not hitherto been indulged in by the British Navy to the same extent as in foreign navies, nor when such tests were made have they invariably been rendered as instructive as they might have been. On such occasions it has been customary to select some obsolete ship and subject it to bombardment by modern ordnance without attempting to reproduce in the target the defensive qualities that would be encountered in modern armored ships. Generally, therefore, the result has been to convey an exaggerated impression of the destructive powers of the projectiles employed. This undoubtedly occurred in the cases of the *Belleisle*, *Edinburgh*, and *Hero* experiments. In Germany, France, and the United States a more practical value was often given to such tests by reconstructing the target to resemble in part a modern ship. Germany led the way in this direction, spending large sums yearly on the fitting out of target ships, whole squadrons of which were sometimes attacked simultaneously. The most fruitful American was that to which the *San Marcos*—ex *Texas*—was subjected in March, 1911, for the result brought about a revolution in American ideas of armor protection and led to the abandonment of armor on the topsides and its concentration on the water line, gun positions, and other vital parts. When all is said and done, however, peace experiments can never be as instructive as actual war experience. It is probable that our naval officers and constructors derived more useful information from *Jutland* and the *Dogger Bank* than they could have obtained from years of ceaseless peace experiment on a lavish scale. Whatever the object of attacking the *Baden* may have been, it was certainly not to stage a mere pyrotechnical display. The Admiralty may have desired to test the present type of armor-piercing shell against the thickest armor of a modern ship, to determine some unsolved question of protection, or, perhaps, to try a new piece of naval ordnance in contemplation for the battleships of the current program.

The fact that a triple mounting for heavy guns was used in the experiment is very suggestive, and while there is no definite evidence that this system of mounting is to be adopted in the new battleships, the indications certainly point that way. In common with many other innovations in naval design, we owe this system to the Italians, who first introduced it in the *Dante Alighieri*, laid down in 1909. By taking the bold step of disposing the main armament in triple turrets, the late Colonel Cuniberti was able to mount a battery of twelve 12-inch guns, associated with a powerful quick-firing armament, in a ship of only 19,500 tons, well protected over the vitals, with an adequate coal capacity, and possessing the remarkable speed of 23 knots. Had the conventional twin mounting been retained, it would not, he estimated, have been possible to arm the ship with more than ten 12-inch guns, and even then less weight and space would have been left over for protection, machinery, etc. So substantial a gain went far to offset the objections—real or imaginary—which had previously militated against the grouping of more than two heavy guns in one position. In the same year the triple turret was adopted by Russia for the four

battleships of the *Gangut* class, in the designing of which Colonel Cuniberti had a large share; and in 1910 Austria followed suit by laying down the *Viribus Unitis*, whose twelve 12-inch guns were on triple mountings. Reports of the gunnery trials of the *Dante Alighieri* and *Viribus Unitis* were conflicting, some accounts stating that the complicated mechanism had proved fatal to rapid fire and that the deflection caused by the discharge of the side guns made accurate practice impossible. On the other hand, the Italian authorities professed themselves perfectly satisfied with the triple turret, which, they declared, was as simple to manipulate and as accurate in fire as the twin mounting. Meanwhile experiments were in progress across the Atlantic, and in 1912 it was announced that the two battleships to be laid down that year, the *Oklahoma* and *Nevada*, would have part of the main armament disposed in three-gun turrets. That these must have proved satisfactory is evident from the circumstance that all the American battleships built subsequently, excepting only the four *Marylands*, have their main armament mounted on the same principle. Both the deflection trouble and the tendency, when the three guns are fired simultaneously, of mutual "air wave" interference to prejudice the accurate flight of the projectiles, are said to have been overcome by discharging the right and left-hand guns together and the middle gun a fraction of a second later, the necessary interval being secured by a special device. In the earlier American mountings of this pattern the three guns are apparently mounted on a common slide and could not be elevated or depressed independently of one another; the installation, therefore, was to all intents a three-barrelled gun. But in later ships this principle appears to have been discarded, for a photograph of the battleship *Tennessee*, published in *The Engineer* of May 21, 1920, distinctly showed the three 14-inch guns in each of the forward turrets at varying angles of elevation.

Turning to the question of weight, it would appear that while the Italians employed most of the weight saved by concentrating 12 guns on 4 mountings instead of 6 in increasing the power of the machinery, the Americans have preferred to utilize the margin in reinforcing the armor on the gun positions, with the result that the gross weight of two triple turrets is little, if at all, below that of three twin turrets less stoutly armored. We draw this conclusion from official American figures, according to which the weight of a 14-inch turret, containing three 14-inch 50-caliber guns, is "not far from 2500 tons, of which total, of course, the armor is the greater part." Since the weight of a British pattern turret, containing two 15-inch 45-caliber guns, with their ammunition and accessories, is understood not to exceed 1350 tons, it would seem that the weight of six American 14-inch 50-caliber guns, triple mounted, is greatly in excess of that of six British 15-inch 45-caliber guns mounted in pairs, the figures being 5000 and 4050 tons, respectively. The disparity is so great that we assume that some item or items of weight not included in the British total are contained in the American figure. Hitherto the triple mounting has been looked at askance by British naval opinion, but it may well be that the necessity of endowing our new ships with increased gun power without unduly magnifying dimensions has forced the Admiralty to accept a system which it does not view with entire favor. In that case its attitude is on a par with that of Rear Admiral Twining, U. S. N., Chief of the Bureau of Ordnance, who in 1912 expressed a dislike for the triple turret, but nevertheless recommended it as the only method by which the weight needed for additional protection could be saved. Although the triple turret has yet been fitted in a British ship, 12-inch mountings of this description are believed to have been manufactured by Armstrong, Whitworth and Co. for the Italian Government, and a description of one such mounting, designed at Elswick, was published in 1913. In this case the guns were independently elevated and depressed by hydraulic power, controlled by valves in the sighting position.

Provided that accuracy of fire and facility of working the guns are not unduly prejudiced thereby, the adoption of triple turrets for our new ships, if resolved upon, must be considered a wise step. Having decided to resume capital ship construction after a pause of five years, we find that other powers are completing and building ships which in armament and speed will far surpass the finest vessels we now possess. Our designers must therefore cast about for some expedient which will enable them to produce a new type, approximately equal in battle power to the best ships in other navies, without putting an intolerable strain on the national purse. It would be easy enough to recover our place at a bound by laying down ships of unheard-of dimensions and cost, but there are weighty reasons against such a policy. The solution must consequently be sought, not in mere size, but in technical modifications, such as a greater concentration of armament, new methods of protection, and weight-saving principles in the machinery department. If our designers and marine engineers are put upon their mettle they will, we feel confident, evolve a type of warship which need fear no comparison with foreign contemporaries of equal or greater displacement and cost. The most powerful battleship now under construction is the United States *Indiana* type, which displaces 43,200 tons and is armed with twelve 16-inch 50-caliber guns, the speed being 23 knots. It does not follow that the Admiralty will deem it prudent to put so many eggs into one basket, nor is it certain that 23-knot battleships would be the most suitable investment for the British Navy. By contenting ourselves with a battery of ten 15-inch or 16-inch guns, in four turrets, with adequate but not exaggerated protection against gunfire and submerged attack, machinery and boilers designed to generate the maximum power for their weight, and—last but not least—by thoroughly reviewing the existing standards of stress to determine the feasibility of accepting lighter scantlings, we may arrive at a type of ship which, if inferior in displacement and cost to the heaviest vessels building elsewhere, will yet be admirably suited to the requirements of the naval defence of the Empire.—*The Engineer*, Apr. 22, 1921.

BRITISH SHELL AND ARMOR AT THE BATTLE OF JUTLAND.—*Excerpt from Speech by Sir Robert Hadfield, Bt.*—It is very regrettable if the impression should have become prevalent, not only in England, but abroad also, that the British ships were inferior to those of the German Fleet.

After a careful study of the dispatches and other sources of information, one is now forced to the conclusion that the British vessels are second to none either in construction or material, as shown in the recent and very able paper, "Notes on some features of German Warship construction," by Sir Eustace T. d'Eyncourt, K. C. B., F. R. S., read before the recent session of the Institute of Naval Architects, and also a paper by Mr. S. V. Goodall, M. B. E., read at the same session, on "The Ex-German Battleship *Baden*."

So far as we here are concerned, the principal interest is centered in the matériel side, and Sheffield has every right to be proud of the great part it has taken in producing machinery, guns, armor, and projectiles required for the fleet, which have proved to be entirely adequate for their respective duties within the scope of their design.

The calamity, almost incredible in its swiftness and completeness, which overtook three of our armored cruisers appears to have led to a belief in the super-excellence of the German armor piercing shell, and the public has attributed the sinking of these three ships to the inferiority of their armor.

In considering the protection provided for our vessels, it is difficult to avoid entering the field of design, and, if this side is omitted, it is not possible to form a just appreciation of the value of the armor plates fitted in the British ships.

The distribution of the armor has a very marked influence upon its value, and for a given weight above the minimum necessary its increased value as "protection" is out of all proportion to the increase of the weight.

The German battleships of the *Kaiser* class built in 1911 were armored to the extent of 35 per cent of the total displacement, while similar British ships, the *Orion* class, had but 29 per cent. The *Seydlitz*, built in 1912, carried 31 per cent, against the ships of the *Lion* and *Queen Mary* class of the same date, 23 per cent.

Thus, while there is an important difference between the percentage weights of armor worn by the opposing vessels, these figures give but an inadequate idea of its actual protection value.

It is common knowledge that the German Fleet was never intended to seek its enemy in foreign waters, while our fleet sacrificed armor in order to carry fuel sufficient to fight an action wherever the enemy might be found, and in addition to this our designers were under the added and important restrictions imposed by the lack of capacity in the available dock accommodation.

It is, however, a fact that British armor withstood the attacks which it was designed to defeat, and kept out the German projectiles wherever its thickness warranted this expectation.

The 9-inch armor on the *Queen Mary's* turret failed under the concentrated effect of two, and probably three, armor-piercing shell fired by the *Derfflinger*, a blow approximating to 48,000 foot tons; the *Indefatigable* succumbing to two blows approximating to 32,400 foot tons from the 11-inch guns of the *Von-der-Tann*, delivered in quick succession, one taking effect in the vicinity of the after-turret, the second striking the 7-inch armor immediately under the fore-turret.

Later in the day a 7-inch turret in the *Invincible* was struck by a salvo of three or four shells from the 12-inch guns of the *Derfflinger*.

The *Queen Mary* was only in action 32 minutes; the *Indefatigable* 15 minutes, and the *Invincible* 12 minutes. In each case the ship sank due to the explosion of the magazine below.

The 11-inch and 12-inch belt armor of the German battle cruisers was perforated repeatedly, and it was due to their armored decks and to their very adequate sub-division into watertight compartments more than to their heavy belt armor that four of them managed to struggle back to port, there to remain under repair for some five or six months.

My firm are particularly interested in the matter of the performance of the armor-piercing shell of the fleet, and now that the imposition of silence has passed I feel one may be permitted to speak upon a matter which so nearly concerns ourselves.

The impression created by the statements in Lord Jellicoe's book was as fortunate as it was unintentional. A close examination of the actual phrases used discloses the fact that there was no imputation against the metallurgical properties and treatment of the shell body as an armor piercer, and, indeed, where the shell functioned properly as a whole, the turret, side, and deck armor of the German ships was repeatedly perforated; and this not with salvos, but by shell falling singly.

Photographs published in the *Engineer*, February 20, 1920, show the excellent effects obtained.

That Lord Jellicoe, on his appointment as First Sea Lord, assembled a committee to consider the whole subject of the performance of the British projectiles is a matter for congratulation.

As a result of their deliberations, it became immediately evident that not only the explosive, the method of filling, and fuse then in use, demanded improvement, but also that the old proof requirements for the armor-piercing shell bodies were out of date.

The Admiralty therefore presented to the armor-piercing shell manufacturers the problem of the attack of armor at an angle to its face, and

Lord Jellicoe, in his later book, "The Crisis of the Naval War," records his appreciation of the work done in the following words:

"The greatest credit was due to the Ordnance Department and to our enterprising manufacturers for the feat which they achieved."

Fortunately, my firm, amongst others no doubt, had already travelled some distance along that path, but the conditions asked for were far more severe than any that had been hitherto seriously considered by the authorities and technical experts of any of the great naval powers.

It is impossible to convey in a few words the many technical difficulties met with in solving the problem, but it is sufficient to say that they involve a complete revolution in armor-piercing projectile manufacture, not only metallurgically, but in design also; and the whole problem had to be worked out with the least possible delay, and under war conditions of labor.

Although in the case of my own firm we had previously accomplished a great deal, as official records, if consulted, would show, the final solution of the problem occupied several months of research and experiments, but by then success at proof tests was more or less established, and, as stated by Lord Jellicoe, within twelve months the fleet was equipped with armor-piercing shell of this new type.

Since that time further improvements have been introduced, and the work of investigation and research still progresses. We may here remark that some wonderful results have been obtained.

It must not be supposed that the total expenditure of ammunition at Jutland consisted exclusively of armor-piercing projectiles. The choice lies largely in the hands of the Captain and gunnery officer of the ship, and is governed by the description of the target, the range, and the visibility.

The British fired rather less than 50 per cent of armor piercers, and when the diversity of the targets (enemy ships) is remembered, this is not surprising. It would be as wrong to fire armor-piercing shell at a destroyer or light cruiser as it would be to fire high-explosive shell at an armored battleship, and the lack of visibility no doubt militated against a larger proportion of armor piercers being used.

Commander Von Hase remarks that while he in the *Derfflinger* used only armor-piercing projectiles, the gunnery officer of the *Lutzow* used high-explosive exclusively against the *Lion*, and this explains the outbreak of fires which occurred in that ship during the early part of the action.

There is no official record of the number of hits obtained by heavy shell, but from other sources we may by selection arrive at a useful comparison of the relative efficiency of the British and German projectiles.

The *Princess Royal* was hit nine times, probably all 12-inch armor-piercing shell, and remained in action with one turret disabled.

The *Derfflinger*, hit by seven heavy shell of 13.5-inch or 15-inch caliber, probably all armor-piercing projectiles, remained in the line, but with her two after-turrets wrecked, a third partially disabled, and only one turret left in effective condition.

The *Warspite* received 27 hits by heavy German shell, and after the action steamed across the North Sea at full speed.

The *König*, having only 15 hits, arrived with difficulty at Hamburg with four of her forward compartments flooded, and her forecastle only six feet above water. The ship was so damaged as to be *hors de combat*.

It would be unfair to attribute the sinking of the three British battle cruisers to the armor-piercing qualities alone of the German projectiles. It should, too, be borne in mind that the armor on these particular ships was comparatively thin. That the turret armor of these three ships was perforated there is no doubt, but this result seems to have been attained by the weight of the combined blow of several shell striking more or less together, and not to the armor-piercing effect of single shell.

The immediate cause of their loss was the explosion of their magazines, and this might equally well have been the fate of the *Lion*, whose turret armor was perforated, and also the *Derfflinger*, whose two after-turrets were wrecked by British armor-piercing shell.

None of the British armored ships were sunk as the direct effect of gun attack, while two German ships, the *Lutzow* and *Seydlitz*, actually suffered this fate. The former ship was finished off with a German torpedo to hasten her end, while the latter was run ashore to prevent her sinking in deep water.

We thus arrive at the conclusion that any impression of German superiority in material is unwarranted.

Having had the exceptional opportunity of examining in a most exhaustive manner modern German (Krupp) armor-piercing shell, and also been in possession of comparative results of plate tests of contemporary German and British armor piercers, it can be confidently asserted that at the time of the Battle of Jutland the British ships were armed with a better projectile.

Shell of the improved type, now forming the armament of our ships, are not only far more efficient than the older type, but are well in advance of anything yet produced by other countries.

From the statements of our First Sea Lord, and also the Report of the United States Board of Admiralty (1920), it is clear that we must in no way relax our efforts of research and development in this direction. Both emphasize the fact that the battleship is still the main power of the fleet. The words of the United States Admiralty Report sums up the matter thus:

"Nothing that occurred during the World War has served to change the opinion of the General Board as to the vital importance in war of the battleship, the ship that can at once give and take heavy blows."

During history our fleet has progressed along strictly evolutionary lines, and it is only by following this precedent that we can maintain our supremacy.

With the lessons of Jutland before them, the Admiralty have stated their intention of continuing the development of the capital ship, and no one who has made a study of the true facts can question the correctness of their decision.

There is no reason why this policy should deprive the submarine and aircraft school of their right and proper opportunities for development.

The era of armor and armor-piercing shell has by no means passed, and there is no sign of relaxation in the world's effort towards the improvement of these essential factors.

THE OPERATION OF HEAVY ARMORED TURRETS.—After discussing the advantages of the several methods in use for manipulating armored turrets and their internal mechanism, whether hydraulically, electrically, or by compressed air, the author comes to the conclusion that the power supplied should be electric, and should be led in by movable pivoting leads. Training is best performed by electricity, while the elevating, loading and breech mechanism is best operated hydraulically, and he gives considerations which should govern the choice of the type of drive most suitable to the other operations.

The hydraulic power required in the turret should be generated in the moving turret itself, by using electric pumps, having standard parts which can be replaced and repaired on board the ship.

Whether any alterations will be required in the elevating gear in turrets adapted to director-work remains to be seen; for at present the use of hydraulic power developed in the turret by electric means has not been put to test. (Oberregierunzsaurat Methling, *Schiffbau*, Oct. 20, 1920.)—*The Technical Review*, Mar. 29, 1921.

RADIO

GUNNERY AND TORPEDO-PLANING.—*Sir:* As an American of English descent, a former member of the Naval Consulting Board, and a man interested from boyhood in navies and in everything pertaining to the sea, I have always been an intense admirer of the British Navy. I have been especially an admirer of the work of the late Lord Fisher—whom we regard as one of the great figures of naval history—in mechanizing British sea power, and of the strides made by the British Navy, under the leadership of Admiral Sir Percy Scott, R.N., in speed and accuracy of gun fire, since the latter's first memorable performance in H. M. S. *Scylla* in 1899, both in using individual naval telescope sights on gun mounts and with the director system.

As one of the pioneers of the aeronautical movement, and a governor of the Aero Club of America for many years, I have been profoundly impressed by the British Navy's skilful development of the torpedo-plane since 1913; and I believe that great good will result from the controversy now going forward in your country and ours over the effect the torpedo will have on the capital ship.

But, while having the utmost respect for the superb performance of the British Navy, I cannot square with the spirit of fair play, for which the British officer is beloved the world over, the fact that British naval officers, in discussing their achievements in gunnery and torpedo-planing, have continually refrained from mentioning the truth that they owe the naval telescope sight, the director system, and the torpedo-plane to an American naval officer, the present Rear-Admiral Bradley A. Fiske.

Admiral Fiske—then Lieutenant Fiske—took out the basic patents for the naval telescope sight and the director system in 1890. Both were described on page 506 of London *Engineering* on April 24, 1891, and in *La Revue d'Artillerie* on March 12, 1892, as well as in such newspapers as the *New York Times*, and many naval and scientific periodicals on many occasions. Furthermore, the fact was later published broadcast, that on September 22, 1892, on board the U. S. S. *Yorktown*, in Behring Sea, Lieutenant Fiske, using his telescope sight, made a record at target practice with a six-inch gun that was wholly unprecedented. This subject was elucidated at great length by Lieutenant Fiske in an article that was published in the U. S. NAVAL INSTITUTE PROCEEDINGS in June, 1896.

Moreover, it was perfectly well known by all the navies that the U. S. Navy adopted the telescope sight shortly after Lieutenant Fiske's demonstration in 1892, and that it was used in the U. S. S. *Olympia* at the battle of Manila Bay on May 1, 1898, and in all the American battleships at the battle of Santiago on July 3, 1898. Still, the British Navy date the improvement of modern naval gunnery from the performance of H. M. S. *Scylla*, in 1899, and attribute the invention of the naval telescope sight and the director system to Sir Percy Scott.

I cannot but find the British Navy similarly remiss in regard to the torpedo-plane, for the torpedo-plane was patented by Admiral Fiske on July 16, 1912; and the fact was widely published, and with full illustrations and description, during the remaining months of 1912 and the early part of 1913. The British and Italians began experiments with it in 1913. In 1915 certain Turkish craft—I think four—were sunk by a British torpedo-plane in the Sea of Marmora, and in 1917, I believe, the Germans sank two British steamers in the North Sea. Since then all the great navies have been at work developing it; but so far as I have been able to ascertain, they have not only followed the general plan described in Fiske's original patent, but have adhered almost exactly to the mechanical apparatus described in his patent, even to its details. Nevertheless, Mr. Bywater, in your issue of February 16, 1921, refers to Fiske merely as the first to advocate air torpedo work in the United States.

All of the facts that I narrate can easily be verified by reference to the United States Patent-Office, and to leading newspapers and other periodicals printed in the English, French, German, Spanish, Russian, and Japanese languages, and to Fiske's autobiography, which has been on sale in England for more than a year.

Surely it cannot be the intention of the British Navy to claim credit it does not deserve, not to withhold from a distinguished officer in a sister navy the credit to which he is entitled for useful achievement.

In closing, please permit me to express my appreciation of the fairness and good feeling which you invariably display in treating American subjects. Your attitude has won you the confidence and respect of your American readers.—Respectfully,

HENRY A. WISE WOOD.

—*The Naval and Military Record*, Mar. 30, 1921.

WHO INVENTED TORPEDO-PLANES?—We published in our issue of March 30 a letter from Mr. Henry A. Wise Wood, of New York, who entered a courteous protest against the presumption, general on this side, that the naval telescope sight, the director system, and the torpedo-plane were British inventions, when the fact is, he declared, that we owe all these things to an American naval officer, the present Rear-Admiral Bradley A. Fiske. We forwarded Mr. Wood's letter to Admiral Sir Percy Scott, and invited him to comment upon it, but, being at present away from his books of reference, he has been unable to favor us with a detailed reply. However, he informs us that when he was commander of the *Edinburgh* in (he thinks) 1897, telescope sights had been in use on turrets for some time, but "possibly Admiral Fiske was the inventor." We believe that Admiral Fiske was, in fact, first in the field with this device, which made accurate shooting possible at long range and certainly the evidence which Mr. Wood adduces on this head seems overwhelming.

We have also read that Admiral Fiske evolved an effective system of director firing many years ago, but we do not know whether this system was fundamentally the same as that which Sir Percy Scott perfected, or whether its introduction into the United States Navy ante-dated the adoption of the Scott director by the British Navy. As regards torpedo-planing, we are aware that Admiral Fiske has been for some years a strong advocate of this weapon, and we accept Mr. Wood's statement that the Admiral was the pioneer of air torpedo tactics. So far as we are concerned, the last thing we desire is "to withhold from a distinguished officer in a sister navy the credit to which he is entitled for useful achievement." Admiral Fiske, we would add, is widely known and esteemed in British naval circles both as a sea officer of the very best type and as a man of brilliant inventive genius. We remember him, also, as having publicly defended the policy of the British Admiralty towards the *U*-boat menace at a time when that policy was being subjected to criticism by other American officers who were not conversant with the peculiar conditions of warfare in the North Sea.—*The Naval and Military Record*, Apr. 20, 1921.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Influence of the Depth of Water on Speed of Ships. II. *The Engineer*, Apr. 1, 1921.

The Passenger Carrying Airship *R-36*. *Engineering*, Apr. 15, 1921.

Radio Communication with Postal Aeroplanes. *The Aerial Age Weekly*, Apr. 18, 1921.

British Sloops during the World War. *Marine Engineer and Naval Architect*, April, 1921.

Liquid Oxygen Explosives. *The Engineer*, Apr. 22, 1921.

Wireless Telephony. *Journal of the Royal Artillery*, April, 1921.

NOTES ON INTERNATIONAL AFFAIRS

FROM APRIL 10 TO MAY 10

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. Naval Academy

GERMAN REPARATIONS SETTLEMENT

UNITED STATES MEDIATION.—According to the Treaty of Versailles, May 1, 1921, was the date fixed for final settlement of the amount of German reparations. On April 20 Germany sent an appeal to the United States Government, requesting the President to mediate the reparations question, and pledging itself to fulfil "all the provisions of any award that may be made."

This request Secretary Hughes declined in a brief note as follows:

WASHINGTON, April 21, 1921. This government could not agree to mediate the question of reparation with a view to acting as umpire in its settlement.

Impressed, however, with the seriousness of the issues involved, as they affect the whole world, the government of the United States feels itself to be deeply concerned with the question of obtaining an early and just solution. This government strongly desires that there should be an immediate resumption of negotiations and reiterates its earnest hope that the German Government will promptly formulate such proposals as would present a proper basis of discussion.

Should the German Government take this course, this government will consider bringing the matter to the attention of the allied governments in a manner acceptable to them in order that negotiations may speedily be resumed.

GERMANY HOLDS GOLD RESERVE.—On April 18 the Reparations Commission demanded that, as security for payments to the Allies, the entire gold reserve of the German Reichsbank, amounting to 1,100,000,000 gold marks, should be transferred to the branch banks at Cologne or Coblenz in territory under Allied control. This Germany refused, and the refusal was regarded as a further violation of the treaty requirements.

GERMAN REPARATIONS PROPOSAL.—Following the refusal of the United States to act as mediator, the German Government submitted through the agency of the United States a final proposal, which was declared to be "the maximum of what can be offered." The proposal was to pay reparations to the amount of 50 billion gold marks (present value) in the form of annuities which would bring the ultimate total of money paid to about 200 billion gold marks. Various details and somewhat vague conditions were attached, including 1 billion marks as initial payment, 4 per cent interest, and an offer to take over the Allied debts to the United States.

ALLIES REJECT GERMAN OFFER.—The French Government at once signified to the American Government its rejection of the German proposal, stating that the German offer was but 50 per cent of the total agreed upon by the Allies at Paris (226 billion gold marks plus 12 per cent of the value of exports) and but 35 per cent of the Reparations Commission's more recent estimate of about 140 billion marks (present value). Premier Lloyd George in Parliament on April 28 declared the offer "thoroughly unsatisfactory." Secretary Hughes on May 2 transmitted the Allied views to Germany in a brief note which advised Germany to make at once "clear, definite, and adequate proposals, which would in all respects meet its just obligations."

ULTIMATUM TO GERMANY.—The Supreme Council, in session in London, on May 5 presented to Germany an ultimatum requiring that Germany admit liability for the full 132 billion marks (present value) fixed by the Reparations Commission, and that this admission be made before May 13, on penalty of Allied occupation of the Ruhr Valley. France called the class of 1919 to the colors and mobilized war forces in readiness to enforce the penalty.

DETAIL OF ALLIED DEMANDS.—Paris, May 6.—The Reparations Commission made public to-day the Allied plan for payment by Germany of the reparation account. A study of this plan shows that the basis of it is a system of bonds of the face value of 132,000,000,000 gold marks, the total of the indemnity fixed by the Reparations Commission. Germany would pledge herself to pay a sum which would provide for the payment of 5 per cent interest on these bonds and a sinking fund.

This is the plan Germany must accept by noon on May 12 to avoid occupation of the Ruhr. The system is of direct interest to America, for it is an essential part of the plan that the Allies realize in the near future a certain amount of cash, of which America has a great deal and other nations very little.

The system does not call for direct payments by Germany to the Allies. Germany gives bonds to the Reparations Commission, the Reparations Commission hands over the bonds to the different Allied nations and pays to the holder of the bonds interest from a fund Germany supplies.

Therefore France will not receive 68,500,000,000 marks, 52 per cent of the total, in cash, but will receive 68,500,000,000 marks in German bonds. She would not receive these all at once. Twelve billion marks worth of bonds are to be issued at once and 38,000,000,000 more in the future. Therefore a year from now France will be the holder of something less than 30,000,000,000 marks, face value, of the bonds.

France Must Market Bonds.—Now, if France put these bonds in her vaults and held them she would receive interest at the rate of 1,500,000,000 gold marks annually. But that would by no means solve the bad financial situation of the French Government. That would mean an annual reparation income of some 5,000,000,000 paper francs, present value, whereas France has already paid out 55,000,000,000 paper francs for reparation and needs 16,000,000,000 more for this year. Therefore it is obvious France must sell the bonds she would receive.

This raises a question very serious for France of the market value of a German bond paying 5 per cent. It would not sell at par. If all doubt of its value were removed, a study of the market indicates a value something like 75 per cent of par and, due to the uncertainty of Germany's making good, its value would probably be less. Therefore it seems a safe assumption that France's share of the reparation payments is going to be much

less than the face value, 68,500,000,000 marks. To estimate the effect this fact will have on French opinion one should bear in mind that the French public started by expecting 200,000,000,000 gold marks.—*N. Y. Times*, 7/5.

GERMAN ACCEPTANCE.—In the face of the reparations crisis the Fehrenbach cabinet resigned on May 4, but pending the formation of a new cabinet was requested by President Ebert to continue to deal with current affairs. In view of the apparent eagerness of France to enter the Ruhr region, and on the other hand with the prospect of securing the major part of Upper Silesia and creating a favorable impression in England and May 5 swung towards acceptance of the Allied terms. On May 11 the new Wirth Cabinet accepted the terms unconditionally.

UNITED STATES RE-ENTERS ALLIED COUNCILS

TEXT OF INVITATION AND REPLY.—At a meeting of the Supreme Council in London it was decided on May 4 that the United States be invited to send representatives again to the Supreme Council, the Council of Ambassadors, and the Reparations Commission. To this the American Government replied favorably. Ambassador Wallace resumed his seat in the Council of Ambassadors on May 9.

Allied Invitation.—As President of the Allied Conference, which is just completing its sittings in London, I am authorized with the unanimous concurrence of all the powers here represented to express to the United States Government our feeling that the settlement of the international difficulties in which the world is still involved would be materially assisted by the co-operation of the United States; and I am, therefore, to inquire whether that government is disposed to be represented in the future, as it was at an earlier date, at Allied conferences, wherever they may meet, at the Ambassadors' Conference, which sits at Paris, and on the Reparations Commission.

We are united in feeling that American cognizance of our proceedings and, where possible, American participation in them, will be best facilitated by this.

American Reply (May 6).—The government of the United States, while maintaining the traditional policy of abstention from participation in matters of distinctly European concern, is deeply interested in the proper encouragement and in the just settlement of matters of worldwide importance which are under discussion in these conferences, and desires helpfully to co-operate in the deliberations upon these questions.

Mr. George Harvey, appointed Ambassador to Great Britain, will be instructed on his arrival in England to take part as the representative of the President of the United States in the deliberations of the Supreme Council. The American Ambassador to France will be instructed to resume his place as unofficial observer on the Conference of Ambassadors, and Mr. Roland W. Boyden will be instructed to sit again in an unofficial capacity on the Reparations Commission.

The Government of the United States notes with pleasure your expression of the belief of the representatives of the Allied governments assembled in London that American co-operation in the settlement of the great international questions growing out of the World War will be of material assistance.

KNOX PEACE RESOLUTION PASSED.—On April 30 the Senate by a vote of 49 to 23 adopted the Knox Resolution declaring war with Germany at an end. The resolution as finally revised provided: (1) That the Joint Resolu-

tion of Congress passed April 6, 1917, declaring a state of war with Germany be repealed and said state of war is hereby declared at an end; (2) That all property of the German Government or of German nationals in the possession of the United States be retained until ratification of a treaty with Germany; (3) that the United States reserve all rights, reparations, etc., under the armistice and the Treaty of Versailles.

PRESIDENT HARDING ON FOREIGN POLICY.—The passage of the Knox Resolution was in accord with the President's foreign policy as stated in his message to Congress on April 12. In this message he favored a peace resolution "with essential qualifications." As regarded further measures, he said:

"It would be idle to declare for separate treaties of peace with the Central Powers on the assumption that these alone would be adequate, because the situation is so involved that our peace engagements cannot ignore the Old World relationship and the settlements already effected, nor is it desirable to do so in preserving our own rights and contracting our future relationships.

"The wiser course would seem to be the acceptance of the confirmation of our rights and interests as already provided and to engage under the existing treaty, assuming, of course, that this can be satisfactorily accomplished by such explicit reservations and modifications as will secure our absolute freedom from inadvisable commitments and safeguard all our essential interests."

CONTROL OF OIL RIGHTS

BRITISH WOULD CONFER ON OIL CONTROL.—Washington, April 11.—Adjustment of the dispute between the United States and Great Britain growing out of the San Remo oil agreement concerning Mesopotamia has been suggested informally to the United States, it was learned officially to-day.

The plan proposed was in a memorandum reaching the State Department, but not made in such a manner as to place the necessity for decision upon this government until more definite representations are received.

It is proposed that the United States appoint a commissioner to confer with the British Petroleum Commission, in the belief that such direct negotiations would lead to a more speedy adjustment than might be expected through the usual diplomatic exchanges.

Reports from Constantinople crediting Turkish officials with having declared that British nationals never succeeded in obtaining actual concessions from the Turkish Government for the exploitation of the oil resources of Mesopotamia confirm information that has been in the possession of officials of the State Department for some months.—*N. Y. Times*, 12/4.

PROTEST TO DUTCH ON OIL CONCESSIONS.—Washington, April 20.—Under instruction from Secretary Hughes a vigorous note has been delivered to the Dutch Government by William Phillips, American Minister at The Hague, insisting that American oil corporations must have equal opportunities with the Royal Dutch Company, or any other company, in the development of the celebrated Djambi oil fields in Sumatra and other oil deposits in the Dutch East Indies.

Mr. Hughes takes the ground that the United States has a real interest in the development of the future oil supplies of the world, and has informed the Dutch Government through Minister Phillips that the real interest of the United States Government in these matters lies in the recognition of the principle of "mutual or reciprocal accessibility to vital and natural

resources by the nationals of the United States and by those of foreign countries."

In his note to the Dutch Government, Minister Phillips stated that he was not acting on behalf of any particular American company, but pointed out that certain definite propositions, made in the last year, "furnish sufficient evidence that responsible and experienced American interests are ready and desirous to co-operate with the Netherlands Government in oil developments in the Netherlands Indies."

These interests are the Standard Oil Company of New Jersey, whose officials in New York on Wednesday confirmed recent cable dispatches to *The New York Times* from The Hague to the effect that representatives of American oil interests had submitted to the Dutch Government a bid for half of the oil concessions in the Djambi fields in Sumatra.—*N. Y. Times*, 30/4.

ALLIED REPLIES IN YAP DISPUTE

FRENCH REPLY FAVORABLE.—To Secretary Hughes' note of April 4 to the four Allied Powers protesting against Japanese control of the island of Yap and insisting on the right of the United States to share in all decisions regarding mandates, the French Government made a preliminary reply on April 7 stating that a final answer could be made only upon agreement of the four powers concerned. The note pointed out, however, that, while the award to Japan on May 7, 1919, was not restricted, nevertheless the Japanese representatives had official knowledge of the reservations previously made by the representatives of the United States.

JAPAN UNYIELDING.—Correspondence between Japan and the United States in the Yap controversy was made public on April 18. The fact was revealed that the Japanese note of Feb. 26, 1921, insisted that the decision of May 7, 1919, awarding to Japan all former German islands in the Pacific north of the equator was "final," "with no reservations whatever," and that the Japanese Government "would be unable to consent to any proposition, which, reversing the decision of the Supreme Council, should exclude Yap from the territory committed to their charge."

Secretary Hughes in his note of April 4 produced definite evidence of President Wilson's reservations, but insisted further that no mandate decision of the Supreme Council could be final without the approval of the United States as a participant in the war.

ITALY SUPPORTS AMERICAN VIEW.—In a note on April 29 Italy expressed its belief that the United States in regard to Yap was asking merely for equal privileges with other nations, signified complete agreement with the views expressed in the American note of April 4, and noted that the matter had been referred to the Juridical Commission of the Council of Ambassadors.

LEAGUE ASSEMBLY MEETS IN SEPTEMBER.—Notices were sent in May to members of the League of Nations that the second session of the League Assembly would be held as scheduled at Geneva on September 5. The notices included a tentative schedule of business to come before the session.

CIVIL WAR IN SILESIA

POLISH UPRISING.—Early in May reports were circulated that the Allied Commission on Upper Silesia had decided that, aside from the mining districts of Pless and Rybnik and another narrow strip, the territory should be awarded to Germany. Upon this report, Polish insurgents to the estimated number of 20,000 attempted to secure control of the disputed area. The Allied authorities declared martial law and at various points engaged in armed conflict with Polish bands, but their forces were inadequate to maintain order. France on May 4 requested the Polish Government to take all possible measures to prevent disturbances, and at the same time warned Germany against any invasion of the district by German forces. Poland signified to the Allies its disapproval of the action of the insurgents, and urged that announcement of the settlement be made as soon as possible.

UNITED STATES AND LATIN AMERICA

HARDING ON MONROE DOCTRINE.—At the unveiling of Venezuela's gift of a statue of Simon Bolivar, South America's liberator, in New York City, on April 19, President Harding spoke significantly of the meaning of the Monroe Doctrine, and also suggested his purpose of discussing disarmament with other powers. The following passages may be quoted:

The Monroe Doctrine.—"There have been times when the meaning of Monroecism was misunderstood by some, perverted by others, and made the subject of distorting propaganda by those who saw in it an obstacle to the realization of their own ambitions. . . . The history of the generations since that doctrine was proclaimed has proved that we never intended it selfishly; that we had no dream of exploitation. On the other side, the history of the last decade certainly must have convinced all the world that we stand willing to fight, if necessary, to protect this continent and these sturdy young democracies from oppression and tyranny."

A Predicted Call to Disarm.—"In the last half century our American commonwealths have not only been able to hold themselves aloof from competitions in armament, but they have built up a system of international arbitration and adjudication which has constantly lessened the danger of armed conflict. There is too little realization, my fellow-citizens of the Americas, of the progress that had been made toward judicial and arbitral settlement of international differences by the American nations. It presents an example well worthy earnest consideration, and affords us an assurance which will justify our purpose to invite the present-day civilization to cast aside the staggering burden of armament."

COLOMBIAN TREATY RATIFIED.—The treaty between the United States and Colombia was ratified by the U. S. Senate on April 20 by a vote of 69 to 19. The treaty provides for the payment of twenty-five million dollars to Colombia in five annual instalments. The Senate rejected the Borah amendment explicitly denying any complicity of the United States in the secession of Panama. According to the terms of the treaty, Colombia has the right in peace and war to use the Panama canal and railroad for purposes of transporting oil, coal, munitions, and troops from her Atlantic to her Pacific coast.

PANAMA MUST ACCEPT AWARD.—On April 21 the Republic of Panama sent a lengthy note to the American Government, in effect refusing the demand of Secretary Hughes that the Loubet and White decisions regarding the Panama-Costa Rica boundary be at once accepted and put into effect. On May 2 Secretary Hughes sent a more forcible note insisting on the just and binding character of the awards and closing as follows:

"It is precisely because of its friendship for the Republic of Panama, as well as because of its desire to assure itself that the peace of Central America is maintained on a stable basis guaranteed by the scrupulous observance of international obligations, that the Government of the United States feels compelled to state that it expects the Government of Panama to take steps promptly to transfer the exercise of jurisdiction from the territory awarded to Costa Rica by the Loubet award, at present occupied by the civil authorities of the Government of Panama, in an orderly manner, to the Government of Costa Rica.

"Unless such steps are taken within a reasonable time the Government of the United States will find itself compelled to proceed in the manner which may be requisite in order that it may assure itself that the exercise of jurisdiction is appropriately transferred and that the boundary line on the Pacific side, as defined in the Loubet award, and on the Atlantic side, as determined by the award of the Chief Justice of the United States, is physically laid down in the manner provided in Articles II and VII of the Porras-Anderson treaty.

SOUTH EASTERN EUROPE

RELIEF FOR AUSTRIA.—On May 8 the plan of the League of Nations Financial Commission for the economic rehabilitation of Austria was made public. The first part of the general scheme provides for the suspension of Allied liens on Austrian Government resources, in order that these may be used as security for an international loan to Austria. The Finance Commission of the League assumes virtually the functions of a receiver or trustee, taking control of these sources of revenue and supervising the purposes for which loans are to be used.

A second part of the plan is the breaking down of the economic barrier between Austria and former parts of the Austro-Hungarian Empire. For this purpose delegates from these states assembled at Porto Rosa near Trieste in early May. The Bank of Austria-Hungary was to be reorganized as a bank of issue for the new Austrian Republic.

Among other proposals of the commission may be noted: an internal loan; stopping of further issues of paper currency; reduction of expenditures; issue of new metallic currency.

HUNGARY DECLARES CHARLES LEGAL SOVEREIGN.—In reply to an inquiry from the Swiss Government, the Hungarian Government in April declared that the former Emperor Charles was Hungary's "lawful sovereign" and that "foreign circumstances" alone prevented him from exercising his rightful powers. Switzerland reserved decision regarding the request that Charles be allowed to take up residence in that country.

CZECHO-FRENCH ENTENTE.—Washington, April 24.—France, in continuation of her policy of creating a Slav barrier about Germany and Russia from among the smaller nations of Europe, has concluded a secret offen-

sive and defensive alliance with Czechoslovakia, according to advices received here to-day.

The alliance follows closely upon that concluded by France with Poland. It is reported to be similar also to agreements which France is understood to have attempted recently to negotiate with Jugoslavia, Rumania and Hungary.

By the terms of the alliance concluded by France with Czechoslovakia, the two nations are reported to have given pledges to assist each other offensively or defensively in the event of any of the following eventualities:

"Attempted restoration of the monarchical form of government in Germany, Austria or Hungary: appearance of a Bolshevist coup d'état in either Germany or Austria, or any ambitious effort put forward by Austria or Germany in the direction of union of the two countries."

GREEK DIFFICULTIES IN ASIA MINOR. It became known in April that after the March Conference in London Italy, as well as France, negotiated a secret agreement with the Turkish Nationalists. By the terms of the Italian agreement, Italy in return for economic concessions consented to withdraw Italian troops in Asia Minor and support Turkish demands for restitution of territory in both Smyrna and Thrace. The withdrawal of Italian opposition, and of French troops from Cilicia, increased the difficulties of the Greek campaign in Asia Minor; and it was reported that Greece was seeking peace with the Turks on the basis of giving up Greek claims in the Smyrna region while retaining Greek acquisitions in Thrace.

REVIEW OF BOOKS

"A Naval History of the War." By Sir Henry Newbolt. 350 pages (George H. Doran Company). Price \$5.00.

In this non-technical history, the author deals only with the operations of the British and German navies in the war. His only references to the participation of other navies in the war are the somewhat erroneous statement that "On May 17th . . . a flotilla of 20 American destroyers arrived . . ." and the mention of French battleships at the Dardanelles. While no one will deny to Great Britain the lion's share in the defeat of Germany at sea, other navies did assist and their operations should be mentioned in a book of so general a title. The book goes quite largely into comparative British and German psychology with particular reference to the cause of war and to the development of the submarine campaign.

Admiral Cradock's probable reasons for his decision to fight a superior force in the absence of the *Canopus* are discussed fully, as are also the reasons for the tactics of Jellicoe and Sheer at Jutland. With the author's conclusions as to the success and effect of the Battle of Jutland, many will not agree entirely.

The various naval engagements between British and German naval forces are dealt with chronologically in a popular way and later the battles of Coronel, the Falklands and Jutland are discussed more fully.

In a chapter on "The Standard of Efficiency" the author cites various submarine attacks by the Germans, all chosen to show the German lack of efficiency and "frightfulness." Those who were engaged in the anti-submarine campaign know of many instances wherein the German submarine captains did "play the game," so that to judge the whole service by these cases, bad as they were, seems not entirely fair.

The most interesting part of the book is that describing the exploits of the British submarine service, particularly in Turkish waters.

B. C. A.

"The Principles of War." By Marshal Foch. Price \$7.50. (Published by Henry Holt & Co.)

"*Des Principes de la Guerre*" makes a new appearance in a 1920 edition translated by that versatile military critic, Hilaire Belloc, and published by Henry Holt and Company.

The military student or the dilettante reader with, say, a whimsical taste for strategy, spies the new volume at the book stalls and exclaims, "Here is just what I have been looking for: The Principles of War—and by Marshal Foch! the great generalissimo, published in 1920, and so of

course embodying the product of his remarkable experience in high command during the World War." The literary prospector ingenuously buys.

Let us say that he is of the impetuous unmethodical type—that he curses prefaces or introductions as cumbersome padding and goes directly to Chapter I.

Soon he realizes that he is grazing in the familiar fields of olden times as he recognizes such landmarks as Xenophon, Jomini, Vegetius, Clausewitz, Scharnhorst, Marshal de Saxe, Napoleon—but where are Joffre, Haig, Bing, Hindenburg, Ludendorf, Pershing, the great chieftains of the XXth century!

The book buyer thumbs the leaves backwards until his eye falls upon the opening sentences of the preface: "'Shepherds' fires, lit on a stormy coast, to guide the uncertain seaman': these lines might well be applied to the following pages. They were written for young officers. The reader must not look to find in them a complete, a methodical, still less an academic account of the art of war, but rather a mere discussion of certain fundamental points in the conduct of troops."

"So," says the book buyer to himself, "the book is not, after all, about the cardinal principles of war, but only a manual of troop leading!"

As he searches the preface further he discerns that the subject matter is not the record of conclusions of the experienced field marshal but an exposition of theories entertained by Lieutenant-Colonel Foch.

He is a tight-fisted little fellow, this purchaser. His misinterpretation of the title page will not keep him from squeezing his acquisition for its full value. He reads on "to get his money's worth."

Assuming that readers of the Institute are far more interested in "principles of war" than in troop leading, their attention is invited to Chapter I, wherein there is some excellent military philosophy: that war is not an exact science but an impassioned drama of which the spirit of man is the controlling factor.

Like all the great masters in the art of war, the embryo field marshal, Lieutenant-Colonel Foch, was an ardent advocate of the value of historical precedent and of the necessity for studying military history.

In discussing the value of historical studies, he makes the point that one does not learn the art of war merely by making oneself an encyclopedia of battle precedents. If in the din and fog of battle the commander stops to find in his historical storehouse a set of circumstances similar to the one in which he finds himself, for the sake of discovering what his present course of action should be, his formalism may cost him dear. But accumulated historical precedents, like the study of legal precedents, build up an indoctrinated mind.

"Generally speaking," says the author, "grave situations partially obscure even a bright intellect. It is therefore with a fully equipped mind that one ought to start in order to make war and even to understand war."

This does not undervalue precedent, as precedent. The "fully equipped mind" is such as ought to function rationally. Precedents are means of developing the mind as well as cases for application. The author does not disagree with Napoleon in the latter's reference to the flash of a happy

recollection that comes to the commander in the field. Nor would he deprecate what we have been told about Hannibal's repeated application of tactical devices he had learned in studying Alexander's campaigns. It is by thorough study of history that the military profession acquires the "tricks of the trade" that become second nature. The author summarizes his thought as to the application of history in the paragraph: "In order to do this, we must have a practical teaching including application made to particular cases of fixed principles, drawn from history, in order (1) to prepare for experience, (2) to teach the art of commanding, (3) lastly, to impart the habit of acting correctly without having to reason."

Those who are prone to preach that our strategy should be so and so, because this or that nation does so and so, should read Chapter II, wherein the theme is the national point of view: that the situation must be estimated particularly with reference to the special situation of the several nations from which the doctrine is determined, say, of the offensive or defensive.

The navy may find a thought worthy of pondering in the chapter on "Economy of Forces." If naval tactical doctrine is to bring the greatest possible mass of fire into action at the very beginning, paralleling the enemy's formation, without holding out anything as a reserve to meet the enemy's unexpected maneuver or to take advantage of an enemy opening, it should be remembered that such were also land tactics long, long ago, but that in striving for economy of forces military technique developed the reserve. Will not some naval tactician also discover an economic achievement by a similar tactical development?

Without doubt, the most valuable chapter for the aggregate of all readers is that which discusses *Intellectual Discipline—Freedom of Action as a function of discipline*. This is familiar ground for all War College graduates.

"The art of war," the author quotes Xenophon as saying, "is, in the last resort, the art of keeping one's freedom of action."

It is to keep one's own freedom of action while denying that freedom to the enemy.

"In war, once hostilities have begun, our Will soon meets the independent Will of the adversary."

In order to carry out our plan we must maintain our freedom of action in spite of the enemy.

With the large masses of forces (or large number of ships) to be expected in a major operation, the ability to concentrate is the test. But how can the commander-in-chief be assured of the timely arrival at the right place of his scattered forces unless his intentions are understood and his will obeyed by every unit? The answer is that his subordinates must have:

A mental discipline to understand the result aimed at by the C-in-C;

Intelligent and active discipline (or initiative) in order to maintain the power of acting as desired by the C-in-C; this implies the ability of the subordinate officer to "bring to fruit, with all the means at his disposal, the scheme of the higher command." It is active obedience—highly

intelligent obedience—the intellectual capacity for deciding when to disobey the words of the commander in order to obey his will.

Incidentally, as a foot-note on page 100, Von der Goltz's excellent definition of the much discussed *Initiative* is quoted as "the manifestation of personal will helped by judgment and acting in compliance with the schemes of the high command."

G. C. T.

"The Alpha, Beta, Gamma Navigation Tables." By H. B. Goodwin, M. A., F. R. A. S. (London: J. D. Potter, 1921.)

These tables offer, in a small compact volume, a means of solution of a sight of any heavenly body by time-sight, Saint-Hilaire, or reduction to the meridian, and may also, though with less facility, be used to find azimuth and great circle distance.

The principle of placing natural and log haversines opposite each other, as in Bowditch, has here been extended to the cosines and the method of solution of the time-sight is rendered considerably easier than the usual method.

For solution of sights by Saint-Hilaire this table has little, if any, superiority over the usual method and is distinctly inferior to Aquino's or Ball's tables in that further calculation is necessary to get the azimuth, after the altitude has been found.

D. T. H.

"The Law of Naval Warfare." By J. A. Hall, LL. M., Lieut. Commander R. N. V. A.; of the Inner Temple, London. Lecturer on International Law to Admiral's Secretaries' Course, Portsmouth, England. 2d ed. (London: Chapman & Hall, Ltd., 1921.)

The first edition of this book was published six months before the outbreak of the late war, and was intended to furnish a summary of the rules of international law and British prize procedure, so far as they concerned naval officers in time of war. This second edition published in January, 1921, enlarged and rewritten, has the advantage of the experience and developments of modern warfare which the great war gave and the interesting application of the principles of international law to the great changes at sea resulting therefrom.

The author says in the preface that "from a superficial consideration of the events of the last six years it might appear that, so far as war is concerned, international law has proved to be of no account. In reality the case is quite to the contrary, as the voluminous correspondence between the various belligerent governments and those of the United States and other neutral powers clearly shows. In the war at sea the two main subjects of interest and controversy were the so-called blockade of the central powers by the Allies, and the German submarine warfare." The former, the author claims, was a lawful and reasonable application of the principles of international law to modern conditions; while the latter was manifestly illegal and inhuman, inflicting upon neutrals as well as belligerents wanton loss of life as well as property.

International law as has been said holds good in time of war as well as in times of peace. The change from peace to war changes the gearing, as it were, and the rules of war and neutrality come into play. The sources of the rules of warfare both at sea and on land are as authoritative and well founded as international laws of peace time. They are to be ascertained from treaties which are generally the results of international conferences, having the consent of nations, which consent is the foundation of all international law; they are also derived from the precedents founded on the practice of nations and also from the decisions of learned judges who preside over courts in which prizes are libelled and condemned after a fair trial. Such conferences as those at Geneva for the mitigation of the cruelties of war and for the formation of Red Cross organizations, and the conferences of 1899 and 1907 at The Hague, result in conventions or treaties which are codified rules of warfare. The Declarations of London and of Paris with their rules are of course binding only upon those who have agreed to them, and whose ratifications or accession have made the agreements final. As to the decisions of prize courts, those of Chief Justice Marshall of our Supreme Court and of Lord Stowell of the British prize court stand pre-eminent. Of the decisions of Lord Stowell, Mr. Justice Story, both a learned judge and a learned writer, says: "I have taken care that they shall form the basis of the maritime law of the United States, and I have no hesitation in saying that they ought to do so in that of every civilized country in the world."

Only naval warfare is considered in the book under review and the endeavor is to make it from the point of view of the naval officer. The author, however, though invested with rank as a reserve officer of the British Navy, is normally and primarily a barrister-at-law of the Inner Temple, London. It is not strange as a consequence that a chapter of thirty pages is devoted to the subject of prize courts and prize proceedings, naturally more interesting to a barrister than to a naval officer, especially to officers of a service like our own, who receive neither prize nor bounty money from a prize.

The chapter preceding the one just referred to treats of visit and capture, which naturally is of importance to the naval commander, the boarding officer and the prize master. The rules under this head, though based upon the experience of British naval officers, are in the main those which prevail in the U. S. Navy. In regard to the destruction of neutral prizes the author follows the decision of Lord Stowell in the case of the *Félicité*, that the neutral prize should be released, but, if it should be considered of the gravest importance to the public service of the captors' own state to destroy the neutral prize, then the neutral should have a full restitution in value. In our instructions of 1917 "a vessel *not* engaged in unneutral service must not be destroyed by the capturing officer save in case of the gravest military emergency which would not justify him in releasing the vessel or sending it in for adjudication." The two countries are virtually in agreement in this matter. With the abandonment of the Declaration of London, the British government does not recognize the right of convoy. The United States still follows the Declaration of London in this respect

and claims exemption from search or seizure for the American vessels under the convoy of an American man-of-war. Mr. Hall does not support the contention of the British government in 1915 in the correspondence with the U. S. government that a blockade existed against Germany and its sea coast giving the rights of blockade against neutral trade to Germany. He says that "no blockade of Germany, however, was declared at any time and no case arose to test the legality of this declaration," referring to the declaration contained in the Maritime Rights Order in Council of July, 1916. He goes on to say that "it therefore remains extremely doubtful whether the prize courts would have considered themselves able to apply the order in this respect in the face of previous British decisions and the usual practice of states."

In conclusion I may say that this book is a distinct and valuable contribution to the law of naval warfare, though it must be borne in mind that the author, though endeavoring to be impartial, values above all things British historic precedents and prize courts decisions.

There is a tendency, where naval predominance is both great and essential to the country concerned, to be impatient at any restrictions in naval power, especially by written regulations. Necessities are readily assumed, as they are in a nation having predominant land power. It is always fortunate for the world at large when a war is under way that there is a powerful neutral nation guarding especially and closely the rights of neutrality at sea.

C. H. S.

"The Life of Admiral Mahan." By Charles Carlisle Taylor. Price \$6.00. (New York: George H. Doran Co., 1920.)

To set before the Naval Institute an adequate appreciation of this work is no light task, because our service forum of discussion concerns itself purely or chiefly with things naval while Mahan's distinction and world-wide reputation rest—not upon what he did as a naval officer, but—upon what he did as an historian and philosopher of extraordinary breadth of vision with an astounding capacity for analysis. His motto seems to have been *Felix qui potuit rerum cognoscere causas*.

That he was a faithful, painstaking officer is beyond question. In the performance of duty he won recognition of his character and methods, but he gathered no substantial professional laurels. It is no wonder, then, that only some 20 odd pages out of Mr. Taylor's 300 are devoted to Mahan's naval career.

It is my privilege to add an incident or two to this sympathetic and accurate biography. Long before the end of his active service, Mahan said to me, in effect, "The spectacle of a retired officer not knowing what to do with himself and his leisure is distressing. To escape such a condition, I have deliberately made up my mind to busy myself with my pen so that when I, too, go on the retired list, I shall not be idle." Could anything better prove the farseeing wisdom of the man than this remark? Again, I am happy to flatter myself that, in a humble way, I am partly responsible for Mahan's first opportunity and, as is demonstrated by the

portentous results, the chance to show the scope and nature of his genius. When the board, which formulated the plan and aims of the Naval War College, had completed its task, Admiral Luce, its president, turned to his colleagues, Sampson and myself, observing that "We need some one to lecture on naval history and strategy. Where shall we find him?" To this I replied, "Mahan is the very man; why not ask him?" The suggestion was at once adopted; Admiral Luce, as his biographer states, wrote to Mahan, then in command of the *Wachusett* in the South Pacific, inviting him to join the College staff for the purpose in question. This invitation was accepted with an outcome which one might almost say has shaken the world to its foundations. Mahan and the College are inextricably bound together, each to the glory of the other.

It fell to my good fortune to keep the latter alive when, in 1888, Secretary Whitney ordered it away from Coaster's Harbor Island at Newport and placed it under my command at the Torpedo Station. I was well aware that the unacknowledged intent of this move was to kill the College but the latter came into the kindest of hands. Far from neglecting my own child, so to speak, I did my best to preserve its existence, making its sessions while on Goat Island as attractive and valuable as possible, so that, when it was transferred to its fine new building near its original home, little, if anything, had been lost of its traditions and methods. Indeed it was said that the Torpedo Station course was most successful and valuable. For this I was indebted to the coöperation of several eminent men—among whom was the late John Codman Ropes, America's greatest military critic.

It would be a waste of time to enumerate Mahan's literary contributions here since it may be assumed that all naval officers who take their profession seriously have read at least, his "Influence of Sea Power upon History," his "Influence of Sea Power upon the French Revolution and Empire"; his classic "Life of Nelson" and his "Sea Power in Relation to the War of 1812." Had he written nothing more than these, his fame would have been assured. Such, however, were his broad view and firm grasp of world politics and policies that his judgment was eagerly sought on topics as remote from his original, nautical philosophy as "Retrospect and Prospect, Studies in International Relations," "Problems of Asia," etc. A full list of his publications is given in Mr. Taylor's volume. A majority of them, if not all, should be in every naval officer's library no matter under which flag he serves. Especially to be recommended is "From Sail to Steam"—an autobiography. Usually when reading Mahan we have to put on our thinking caps for he moves in an intellectual atmosphere far above that in which we lesser mortals have our being but in this particular volume he descends to our level and shows himself to be a delightful *raconteur*, gifted with a charming sense of humor. Read it, by all means, and thus get to know the man as he really was and share in the personal affection of those of us who were honored with his friendship and—in some instances—with his intimacy. One side of his character is best revealed in his "Harvest Within, Thoughts on the Life of a Christian." Mahan was deeply and consistently religious. One may well believe that he never did a thing not approved by his sensitive conscientiousness.

Carried away by devotion to its subject we have strayed widely from the book under review which does full justice to Mahan's literary triumphs and the honors showered upon him by the leading universities of England and America. That he profoundly affected national policies cannot be denied. Indeed, the thought may not be stifled that, through opening Kaiser Wilhelm's eyes to the importance of sea power (vide Chapter XIV, the Margin of Naval Strength) he was directly the cause of that monarch's embarking upon a career of naval expansion which was no slight factor in bringing about the World War. On the other side of the North Sea an appeal to his authority sufficed to secure support for the British Admiralty in initiating and carrying on a building program which preserved to Great Britain an indispensable superiority afloat that eventually spelt defeat to Teutonic arms. It is no idle figure of speech to recognize Mahan's hand both in the outbreak and the conclusion of hostilities. Unfortunately for himself, the Hun was more enthusiastic than thorough as a disciple of the great American philosopher.

Mahan had the courage of his convictions. Read the chapter in this book on the Freedom of the Seas which tells of his opposition at the first Hague Conference to the proposed immunity from capture of belligerent property on the water. He knew, and he was practically alone among the delegates in knowing, that such immunity would have paralyzed any sea power in time of war and would have vastly aided the nation with a great army. Imagine the results of such a policy in the years from 1914 to 1918 and bless Mahan for his timely counsel which later led to Germany's undoing.

And he possessed unusual foresight in refusing to commit himself to the disapproval of the use of asphyxiating gases. Mr. Taylor remarks in this connection:

"The correct interpretation of his intention would seem to be that while he did not advocate their use, he contended that little or nothing was known as to their effects, and his object ostensibly was to preserve for the benefit of the United States any advantages which might accrue to them from the skill of American chemists in the invention and manufacture of this type of destructive force."

In reading his contributions to current periodicals subsequent to, say, 1900 it is impossible not to perceive, concealed between the lines, or even openly stated, the conviction that Germany was about to wage another war of aggression. In 1910 he said that the naval position and maritime power of Great Britain were supreme, "the sole military force in the world superior to anything that Germany can as yet bring into action" and forewarned the nations that concentration of the British fleet in the North Sea, successfully blockading German ports, would decide the issue (p. 209). As if this were not enough to prove the accuracy of his prevision, Mahan made this remarkable prophecy shortly after the war started, that "Germany's future on the sea would end in a sail to English ports to surrender."

Lest we, his colleagues, be charged with a wholly legitimate prepossession in his favor let this pronouncement of one of the ablest of living men be quoted. Lord Sydenham of Combe uses these expressions:

"The secret of Mahan's success was the breadth of view of the writer. One felt, in regarding his calm and often stately periods, that he was regarding history from a pinnacle whence nothing petty was visible, that he addressed his fellow-men of all nations, and that his judgment in matters where bias might have been looked for was serenely impartial. The books bore the impress of statesmanship in the highest meaning of the word."

The volume under review is essentially valuable in presenting the opinions of Mahan's work from an international, not local standpoint. That these agree with those entertained by his own countrymen is highly gratifying. Nowhere else is this world-consensus better summarized than between the covers of this one book which should be attentively studied by the members of a profession that he adorned while with us, who mourn his irreparable loss and who anxiously inquire, where shall his successor be found?

C. F. G.

"Poe, How to Know Him." By C. Alphonso Smith. Price \$2.00. (The Bobbs-Merrill Company.)

Although Edgar Allan Poe was not a writer of sea stories, there is that something in his writings that makes appeal to mariners. For one thing, his art in dealing with the mysterious assures his works a place on the cabin shelf. Booklovers of the navy, therefore, will join in extending a welcome to this new volume, "Poe, How to Know Him," by Professor C. Alphonso Smith, Head of the Department of English, United States Naval Academy.

Professor Smith corrects the popular impression that Poe was a disolute man of morbid genius: he describes the true Poe as a man distinguished for "the diversity of his interests, his future mindedness, his sanity, and his humanity"; he makes us acquainted with a poet and story teller famed throughout the world for "his wealth of sheer intellect and his equal dowry of constructive imagination together with his almost uncanny feeling for form and color, for the fitting melody and the enhancing background."

On the opening chapter Professor Smith explains the plan and method of his book:

"Poe has been studied as an effect, the effect of unfortunate inheritance, of cramping poverty, of uncongenial environment. But let us study him as a cause. A voice is studied backward from its reach and resonance. A projectile force is studied, not merely in its constituents, but by its power to project. 'By their fruits ye shall know them,' not by their roots."

With skill and tact the author has proceeded to accomplish his purpose. "Old world voices are requisitioned to speak for him (Poe), and he in turn, through the wide gamut of his work, is permitted to speak for himself."

The material of the book is conveniently divided into six chapters.

I. *The World Author*.—After a brief summary of the bare facts and dates of Poe's life, his fame abroad is described at length.

"The story is pitiful enough if we end it, as men thought it was ended, on that October afternoon that saw Poe laid beside his grandfather at the corner of Fayette and Greene Streets. But to know Poe we must follow him not to his death but to his coronation in 1909. That year marked his centennial, as it marked the centennial of Lincoln, Holmes, Darwin, Gladstone, Tennyson, Chopin, and Gogol. It was then that historians looked back over the century and attempted a fresh appraisal of the men who had now rounded out their first hundred years. At the University of Virginia, in Baltimore, in New York, in London, in Paris, in Madrid, and in Berlin. Poe's birthyear was celebrated by memorial meetings and centennial articles as the birthyear of no other American poet or prose-writer had ever been celebrated before.

"The story of his conquest of world opinion can be told only in outline. It is a story, however, more dramatic in interest than any that he himself wrote. The American is not to be envied who does not feel a patriotic pride in the career of an author who, if he could not lift himself above the handicaps of habit and ill health and poverty, yet drove through them, and gave to the outside world its first and most lasting conception of Americanism as literature. To know Poe one must know this larger story."

II. *The Man*.—Poe's character, his interests, religious views and philosophy are briefly discussed.

"So far from being unrelated to the problems and interests of his time, Poe seems to me the one man in American literature from whose writings a history of the essential thought-currents of the time could be garnered. But by his writings I do not mean primarily his poems or his stories; in these he deliberately turned away from the things of every-day life or so subtly transfused them as to make the distillation not easily identifiable as concrete incident or personal experience. I mean, above all, the criticisms that he passed on the men and women and things and themes that made up the life round about him."

As evidence of Poe's interest in current political questions and also of his vision, the following is quoted from his comments on the "Report of the Committee on Naval Affairs," of March 21, 1836:

"Our pride as a vigorous commercial empire should stimulate us to become our own pioneers in that vast island-studded ocean, destined, it may be, to become, not only the chief theatre of our traffic, but the arena of our future naval conflicts."

The trend of Poe's speculations on sociology and theology is indicated in several passages. Consilience with the views of John Stuart Mill, contemporary British philosopher and writer, may be noted. The following is quoted from Poe:

"He who, divesting himself of prejudice, shall have the rare courage to think absolutely for himself, cannot fail to arrive, in the end, at the condensation of laws into Law—cannot fail of reaching the conclusion that each law of Nature is dependent at all points upon all other laws, and that all are consequences of one primary exercise of the Divine Volition. Such

is the Principle of the Cosmogony which, with all necessary deference, I here venture to suggest and to maintain."

Concerning Poe's well-known weakness Professor Smith remarks:

"To assert that Poe found poetic inspiration in drink is to fly in the face of all the known facts. Drink did not help him; it hurt him, and he fought it as a foe of art, of thought, of personality, and self-respect. The very nature of his work—with its meticulous care in details, its orderliness, its niceties of analysis, its interplay of reason and logic, its symmetry of construction, makes impossible the conjecture that he could have wrought it or any part of it while excited by drink. Poe drank but he was not a drunkard; he was dissipated but not dissolute."

III. *The Critic*.—This chapter numbers 128 pages, is the longest in the book, and many will find it the most interesting.

"Criticism should come first, for it was through criticism that Poe first made a national reputation; and it is in his criticism that we find the clearest exposition of the literary principles to which, from first to last he was consistently loyal in the production of his own creative work.

"But Poe's criticisms are more than introductions to his own works. They have also a value as historical material in the evolution of American literature. They serve as contemporary witnesses to the supremacy of Cooper, Bryant and Irving, and as heralds of the greater group represented by Longfellow, Lowell, Whittier, Hawthorne, Emerson, and Holmes.

"Poe was primarily neither a dissector of sentences nor a commenter on ideas. He dissects sentences and he comments on ideas but only as these make or mar the structural unity, the wholeness of effect, of the piece that he is criticizing. 'Totality of effect' became Poe's touchstone at the beginning of his critical career; and words, sounds, rhythms, sentences, paragraphs, stanzas, plot, and background are held to a strict stewardship not on their own account but as joint agents in carrying out the predetermined design."

Poe's analysis of "The Raven" is given complete. The nature of this stimulating study is indicated by Poe's introductory sentence:

"It is my design to render it manifest that no one point in its ('The Raven's') composition is referable either to accident or intuition—that the work proceeded, step by step, to its completion with the precision and rigid consequence of a mathematical problem."

IV. *The Poet*. V. *The Writer of Short Stories*. VI. *The Frontiersman*.—These last three chapters are for the most part anthological. They comprise selections of Poe's best work, poetry, short stories and essays, supplemented by explanations of technique; and they conclude a book to be read with pleasure and to be studied with profit.

C. C. G.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-eighth year of existence. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers upon subjects of interest to the naval profession, as well as by personal support.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy, subsequent to joining the Institute, will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be three dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

Sec. 10. Members in arrears more than three years may, at the discretion of the Board of Control, be dropped for non-payment of dues. Membership continues until a member has been dismissed, dropped, or his resignation in writing has been received.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly. Subscription for non-members, \$3.50; enlisted men, U. S. Navy, \$3.00. Single copies, by purchase, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ARTICLE, 1922

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the opposite page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition :

1. All original articles published in the PROCEEDINGS during 1921 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1921. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1921 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles be submitted typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. K. HEWITT,

Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ARTICLES

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

The Naval Policy of the United States.
The Navy: Its Past, Present and Future.
The Fighting Fleet of the Future.
Factors Governing American Naval Strength, Absolute and Relative.
The Navy in Battle; Operations of Air, Surface and Underwater Craft.
Escort and Defense of Oversea Military Expeditions.
The Place of Mines in Future Naval Warfare and the Rules Which Should Govern Their Use.
The Relation of Naval Communication to Naval Strategy.
The Influence of Topography on Strategy.
International Law.
Principles on Which Should be Founded the Freedom of Neutral Shipping on the High Seas.
The Present Rule of Neutrality Regarding Contraband and Blockade—
Is it Justifiable in Ethics or in Expediency?
What Will be the Status of the Submarine in International Law?
Aircraft—Its Place in Naval Warfare.
Aircraft, Practical Power of.
Aircraft Warfare, Laws of.
Aviation—Its Present Status and its Probable Influence on Strategy and Tactics.
The Control of the Sea from Above.
The Navy Air Service, Its Possibilities, Rôle and Future Development.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Surface Craft, Future Rôle of.
Armor or High Speed for Large Surface Vessels.
Naval Gunnery of To-day, the Problems of Long Range and Indirect Fire.
Mode of Design and Armament of Ships to Meet the New Conditions of Aerial and Sub-Surface Attack.
Future Development of the Naval Shore Establishment.
Naval Bases, Their Number, Location and Equipment.
Strategic Requirements of the Pearl Harbor Naval Station.
The Navy Yard as an Industrial Establishment.
A Mobilization Program for the Future.
Naval Organization from the Viewpoint of Liaison in Peace and War Between the Navy and the Nation.
Organization of a Naval Communication Service.
Scope of Naval Industrial Activity and the Navy's Relation of Naval Strength.
Social and Industrial Conditions in Relation to the Development of Naval Strength.
The Future of the Naval Officers' Profession.
The Naval Officer and the Civilian.
The Naval Officer as a Diplomat.
The Mission of the Naval Academy in the Molding of Character.
The Limits of Specialization in Naval Training.
The Training of Communication Officers.
Navy Spirit—Its Value to the Service and to the Country.
Morale Building.
Military Character.
Amalgamation of the Supply Corps, Construction Corps and Civil Engineering Corps with the Line of the Navy.
The Influence of the Term of Enlistment on the Efficiency of the Service.
Shore Duty for Enlisted Men.
Physical Factors in Efficiency.
Health of Personnel in Relation to Morale.
America as a Maritime Nation.
Our New Merchant Marine.
The Adaptability of Oil Engines to all Classes of War Vessels.



